

13-A
ILLUMINATION MODELING OF
ROUTE 9 AND UNOCAL
TREATMENT PLANTS

FINAL
ENVIRONMENTAL
IMPACT STATEMENT

Brightwater
Regional Wastewater
Treatment System

APPENDICES

Final

Appendix 13-A

Illumination Modeling of Route 9 and Unocal Treatment Plants

October 2003

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King County has prepared a Draft Environmental Impact Statement (Draft EIS) and Final Environmental Impact Statement (Final EIS) on the Brightwater Regional Wastewater Treatment System. The Final EIS is intended to provide decision-makers, regulatory agencies, and the public with information regarding the probable significant adverse impacts of the Brightwater proposal and identify alternatives and reasonable mitigation measures.

King County Executive Ron Sims has identified a preferred alternative, which is outlined in the Final EIS. This preferred alternative is for public information only, and is not intended in any way to prejudge the County's final decision, which will be made following the issuance of the Final EIS with accompanying technical appendices, comments on the Draft EIS and responses from King County, and additional supporting information. After issuance of the Final EIS, the King County Executive will select final locations for a treatment plant, marine outfall, and associated conveyances.

The County Executive authorized the preparation of a set of Technical Reports, in support of the Final EIS. These reports represent a substantial volume of additional investigation on the identified Brightwater alternatives, as appropriate, to identify probable significant adverse environmental impacts as required by the State Environmental Policy Act (SEPA). The collection of pertinent information and evaluation of impacts and mitigation measures on the Brightwater proposal is an ongoing process. The Final EIS incorporates this updated information and additional analysis of the probable significant adverse environmental impacts of the Brightwater alternatives, along with identification of reasonable mitigation measures. Additional evaluation will continue as part of meeting federal, state, and local permitting requirements.

Thus, the readers of this Technical Report should take into account the preliminary nature of the data contained herein, as well as the fact that new information relating to Brightwater may become available as the permit process gets underway. It is released at this time as part of King County's commitment to share information with the public as it is being developed.

1.0 METHODOLOGY

The proposed treatment plant sites have been modeled for nighttime illumination using the 3-D lighting modeling software AGI32. AGI32 is a product of Lighting Analysis, Inc. This is a private software company that is not associated with a specific luminaire manufacturer. It utilizes photometric data from independent test labs in performing the illumination calculations. AGI32 is widely accepted across the country as a leader in lighting modeling software.

For this study, two models were created for the Unocal site and one model for the Route 9 site. The sites were modeled using the anticipated building configurations and heights at the time of the study. The plant was then illuminated to levels required for personnel safety and operations. Backup data supporting the calculations are provided in Attachment A.

Analysis grids show the predicted illumination at ground level. For this study the grids were set up to cover the body of the site, showing lighting levels around facilities, roads,

and open areas. The grid overlaps off-site to show any potential measurable lighting impacts adjacent to the property line.

2.0 ASSUMPTIONS

The schedule provided in Attachment B shows the various luminaires used for this study. The manufacturers and models listed in the luminaire schedule are representative of the type, style, and quality of the lighting proposed for the Brightwater facility. It is not intended to represent these as a sole-source product for the facility lighting. The luminaire schedule includes a description, light distribution, lamp wattage, typical mounting height, and catalog number for each manufacturer. Catalog cuts for the various types of luminaires are provided in Attachment C. The models do not show any existing or proposed offsite lighting.

3.0 RESULTS

3.1 Route 9 (54-mgd plant)

Model results for the Route 9 54-mgd plant are provided in Attachment D. Illumination modeling was performed for the Final EIS. The modeling used a horizontal grid with receptors placed at 10-foot intervals. One model was developed for 54 mgd. The potential light and glare impacts for the 36-mgd plant would be less than the 54-mgd modeling results due to the smaller facility size. The average on-site pre-curfew modeled lux value is 1.84 lux. The perimeter levels are all less than 1 lux, the E2 requirement as shown in Table 13-6, except for at the plant entrances where the lux levels range from 2 to 5 lux.

3.2 Unocal (72-mgd plant)

Model results for the Unocal 72-mgd plant are provided in Attachment E. The modeling used a horizontal perimeter grid (along the northeast, northwest, and south site property lines) with receptors placed at 10-foot intervals in a 20-foot width (10 feet inside the property line, 10 feet outside). Three horizontal facility grids were prepared: one at elevation 20 feet (lower terrace), one at elevation 35 feet (plant entrance), and one at elevation 125 (upper terrace). The facility grids had receptors placed at 10-foot intervals. For the Unocal 72-mgd plant, the average on-site pre-curfew modeled lux values along the perimeter were less than 1 lux for the horizontal receptors, which is below the E2 requirements as shown in Table 13-6. The average value on-site is approximately 4 to 5 lux on both the upper and lower terraces.

3.3 Unocal (72-mgd plant) with Lid Sub-Alternative

Model results for the 72-mgd plant with the multimodal lid sub-alternative are provided in Attachment F. In addition to the grids described in Section 3.2, the lid was also modeled at elevation 50. Parking, roadways, ferry entrance, and exit were modeled at a 10-foot receptor spacing in addition to the treatment plant facility grids. For the Unocal 72-mgd plant with the lid, the average on-site pre-curfew modeled lux values along the perimeter were 0 to 4 lux for the horizontal receptors, which is well below the requirements shown in Table 3-6. The average value for the parking lot lighting on the lid is approximately 12 lux. The average value for the treatment plant area site was approximately 1 lux.

4.0 REFERENCES

The IESNA lighting handbook reference and application, ninth edition. Mark S. Rea, PhD, FIES, editor-in-chief

Lighting for exterior environments - an IESNA recommended practice RP-33-99

ATTACHMENT A

BACKUP DATA

BACKUP DATA

1 Lux = 0.1 foot-candle

Lamp Type for Site Lighting:

Metal Halide (Pulse Start Type), better color rendering than High Pressure Sodium (HPS) lamps.

Lamp & Ballast Data

Wattage	Initial Lumens (Clear Lamps)	Line Power (Input Watts)
70 W lights (277 V)	5,600 V 5,000 H	90
150 W lights (277 V or 480 V)	15,000 V 12,800 H	190
250 W lights (480 V)	26,300 V 23,600 H	288

V - Vertical Lamp Position

H - Horizontal Lamp Position

**Total Light Loss Factor (LLF) Calculation
(Pulse Start Metal Halide Lamps)**

Wattage	LDD x	LLD x	BF =	LLF
70 W	0.94	0.90	.78	.66
150 W	0.94	0.90	.80	.68
250 W	0.94	0.90	.80	.68

LLD - Lamp Lumen Depreciation (estimated at 6 percent per year)

LDD - Luminaire Dirt Depreciation (enclosed luminaire in a light to medium dusty/dirty area)

BF - Ballast Factor

ATTACHMENT B

LUMINAIRE SCHEDULE

Luminaire Schedule

Type	Description	Dist	Lamp	Mounting	Cat. No.
S1	Pole mounted area light, diecast aluminum housing, flat glass lens, powder painted finish, high power factor pulse start ballast, UL listed complete with pulse start lamp.	M-C-III	150 W MH	20-ft. pole	GARDCO CAT NO. G13-1-3XL-100MH-480-XX-LF
S12	Same as type S1 except with two luminaires located 180 degrees apart.	M-C-III	2-150 W MH	20-ft. pole	GARDCO CAT NO. G13-1-3XL-100MH-480-XX-LF
S2	Pole mounted area light, diecast aluminum housing, flat glass lens, powder painted finish, high power factor pulse start ballast, UL listed complete with pulse start lamp.	M-C-II	250 W MH	30-ft. pole	GARDCO CAT NO. G18-1-2XL-250MH-480-XX-LF
S22	Same as type S2 except with two luminaires located 180 degrees apart.	M-C-II	2-250 W MH	30-ft. pole	GARDCO CAT NO. G18-2-2XL-250MH-480-XX-LF
S24	Same as type S2 except with four luminaires located 90 degrees apart.	M-C-II	4-250 W MH	30-ft. pole	GARDCO CAT NO. G18-4-2XL-250MH-480-XX-LF
W17	Wall mounted area light, diecast aluminum housing, flat glass lens, medium throw, powder painted finish, high power factor pulse start ballast, UL listed complete with pulse start lamp.	MT	150 W MH	Wall	GARDCO CAT. NO. 107-MT-150MH-277-XX
W7	Wall mounted area light, diecast aluminum housing, flat glass lens, wide throw, powder painted finish, high power factor pulse start ballast, UL listed complete with pulse start lamp.	WT	70 W MH	Wall	GARDCO CAT. NO. 107-WT-70MH-277-XX
SB7	Bollard, 42 inches tall, louvered lend, corrosion and vandal resistant, high power factor pulse start ballast, UL listed, complete with pulse start lamp.	V	70 W MH	Ground	GARDCO CAT. NO. BRM824-42-70MH-277-XX-F

ATTACHMENT C

CATALOG CUTS

GULLWING

G13 AND G18 AREA LUMINAIRES

GENERAL DESCRIPTION: The Gardco Gullwing is an area luminaire defined by its sleek profile and rugged construction. Available in two sizes, the housing is one-piece, diecast aluminum and mounts directly to a pole or wall without the need of a separate support arm. The multifaceted arc-image duplicating optical systems provide IES Types I, II, III, IV and V distributions. The door frame is single-piece diecast aluminum and retains an optically clear tempered flat glass lens. The luminaire is completely sealed and gasketed preventing intrusion from moisture, dust and insects. The Gullwing luminaires are finished with a fade and abrasion resistant TGIC powdercoat.

ORDERING

PREFIX	CONFIGURATION	DISTRIBUTION	WATTAGE			VOLTAGE	FINISH	OPTIONS
G18	1	2XL	250HPS			277	BRP	PCB
G13	1 Single Assembly	1 Type I, Horizontal Lamp (G18 pole mounting only. N/A above 400w)	<i>G13¹</i> 50MH¹	<i>G18</i> 100MH⁵	250PSMH⁸	120	BRP	F
G18	2 Twin @ 180°	2XL Type II, Horizontal Lamp	70MH	150MH⁵	320PSMH⁹	208	BLP	LF
	2@90 Twin @ 90°	3XL Type III, Horizontal Lamp	100 MH	175MH	350PSMH	240	WP	PC
	3 Triple @ 90°	4XL Type IV, Horizontal Lamp	150MH	250MH	400PSMH^{2,10}	277	NP	PCR
	3@120 Triple @ 120°	Q Type V, Horizontal Lamp (G18 only. N/A above 400w)	175MH	400MH²	750PSMH^{3,6}	347	OC	POLY
	4 Quad Assembly		100HPS	1000MH^{3,4}	1000PSMH⁷	480	SC	HS
	W Wall Mount, Recessed J-Box		70HPS		150HPS			QS
	WS Wall Mount, Surface Conduit		150HPS		250HPS			RPA1
					400HPS			RPA2
					600HPS			PTF2
					750HPS³			PTF3
								PTF4
								SQPTF
								SG
								SQPA
								TSPA
								SPA

FINISH:		OPTIONS:	
BRP	Bronze Paint	F	Fusing (In Head)
BLP	Black Paint	LF	(N/A with 750w and 1000w)
WP	White Paint	PC	In-Line/In-Pole Fusing
NP	Natural Aluminum Paint		Photocontrol and Receptacle
OC	Optional Color Paint		(N/A with 480V. 1000w maximum combined luminaire wattage)
	Specify RAL designation as shown in Color Selection Guide. ex: OC-RAL7024	PCR	Photocontrol Receptacle only
		POLY	Polycarbonate Sag Lens
SC	Special Color Paint		(G13 - 100w max; G18 - 250w max.)
	(Specify. Must supply color chip)	HS	Internal Houseside Shield
		QS	Quartz Standby
			(G13 - 100w max; G18 - 400w max)
		SG	Sag Glass Lens (In lieu of flat glass)
			(Supplied standard with 750w and 1000w)
		RPA1	3" Round Pole Adapter
			(G18 only. Required for 3" OD round or tapered round poles where top OD is less than 4".)
		RPA2	4" and 5" Round Pole Adapter
			(G18 only. Required for 4"-5" OD round poles)
		PTF2	Pole Top Fitter - 2 3/8" Dia. Tenon
		PTF3	Pole Top Fitter - 3-3 1/2" Dia. Tenon
		PTF4	Pole Top Fitter - 3 1/2-4" Dia. Tenon
		SQPTF	Square Pole Top Fitter
		TSPA	Tapered Square Pole Adaptor
			(G18 only, and required for all tapered square poles. G13 cannot mount to tapered square poles.)
		SPA	Square Pole Adaptor
			(G13 only. Required for straight square poles)

TYPE	PREFIX	CONFIGURATION	DISTRIBUTION	WATTAGE	VOLTAGE	FINISH	OPTIONS

Gardco Lighting reserves the right to change materials or modify the design of its product without notification as part of the company's continuing product improvement program. The Gullwing design is protected by U.S. patent number DES.391.659. The XL optical system is protected by U.S. patent number 5690422.

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Genlyte Thomas Group LLC



GULLWING

G13 AND G18 AREA LUMINAIRES

SPECIFICATIONS

GENERAL DESCRIPTION: The Gardco Gullwing is an area luminaire defined by its sleek profile and rugged construction. The housing is one-piece, diecast aluminum and mounts directly to a pole or wall without the need of a separate support arm. The multifaceted arc-image duplicating optical systems provide IES Types I, II, III, IV and V distributions. The door frame is single-piece diecast aluminum and retains an optically clear tempered flat glass lens. The luminaire is completely sealed and gasketed preventing intrusion from moisture, dust and insects. The Gullwing luminaires are finished with a fade and abrasion resistant TGIC powdercoat.

HOUSING: A one-piece diecast aluminum housing mounts directly to a pole or wall without the need for a support arm. The low profile rounded form reduces the effective projected area of the luminaire to only .8 ft² for the G13 and 1.2 ft² for the G18.

LENS ASSEMBLY: A single-piece diecast aluminum lens frame hinges down from the housing and is secured by a stainless steel lanyard and hinge pin.

An optically clear, heat and impact resistant tempered flat glass lens is mechanically secured with six (G13) or eight (G18) retainers. The electrical and optical chambers are thoroughly sealed with a one-piece memory retentive hollow-core EPDM gasket to prevent intrusion by moisture, dust, and insects.

OPTICAL SYSTEMS: The segmented optical systems are manufactured from homogenous sheet aluminum which has been electrochemically brightened, anodized and sealed. The multifaceted arc image duplicating systems are designed to produce IES Types I (1), II (2XL), III (3XL), IV (4XL), and V (Q). With the 2XL, 3XL and 4XL luminaires, the reflector facets form a conical fan around the arc tube with each facet positioned to be precisely tangent to the top of the arc tube.

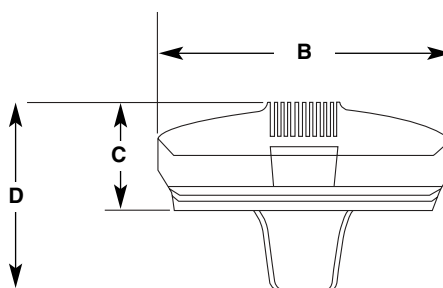
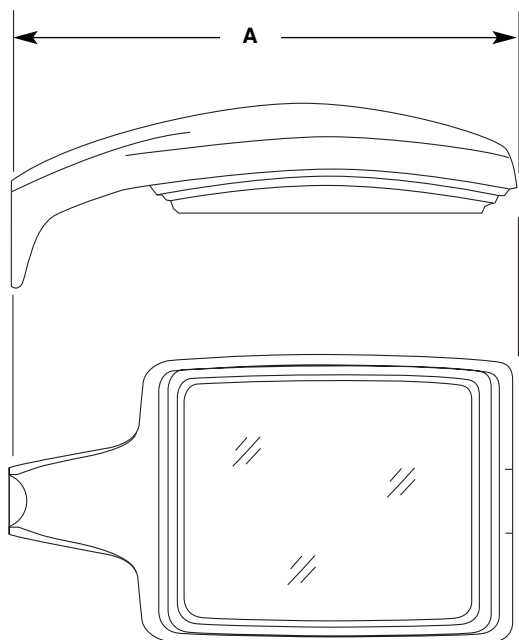
The lampholder is glazed porcelain with a nickel plated screw shell. Position-oriented mogul base sockets to accept high output horizontal metal halide lamps are supplied standard on G18 units. G13 units feature porcelain medium base lampholders.

ELECTRICAL: All electrical components are UL recognized, factory tested, and mounted on a unitized plate with quick electrical disconnects. Each high power factor ballast is the separate component type capable of providing reliable lamp starting down to -20(F).

FINISH: Each standard color luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) textured polyester powdercoat finish. Standard colors include bronze (BRP), black (BLP), white (WP), and natural aluminum (NP). Consult factory for specs on optional or custom colors.

LABELS: All fixtures bear UL or CUL (where applicable) Wet Location labels.

DIMENSIONS



					EPA (ft ²)		
	A	B	C	D	1	2	3/4
G13	22 1/2" 57.25 cm	13 1/2" 34.16 cm	4 3/4" 12.14 cm	8 1/2" 21.54 cm	.8	1.6	2.2
G18	31 1/2" 80.01 cm	18" 45.72 cm	6 1/2" 16.66 cm	11 1/2" 29.21 cm	1.2	2.4	3.2

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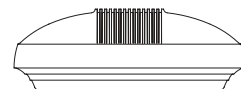
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79115-85/0603

100 LINE



107 GULLWING SCONCE

The Gardco 107 Gullwing high performance sconces offer an excellent alternative to unsightly wall mounted fixtures. These architecturally refined luminaires mirror the styling of the popular Gardco Gullwing luminaire and are designed to integrate naturally to wall surfaces. The 107 luminaires are available with three (3) different distribution patterns - a wide throw, a medium throw and a forward throw. Each luminaire is designed to accept H.I.D. sources up to 175MH, and fluorescent up to 42 watts. Housings are sealed throughout, completely excluding moisture, dust, insects and contaminants.

ORDERING

PREFIX	DISTRIBUTION	WATTAGE	VOLTAGE	FINISH	OPTIONS
107	WT	150 MH	277	BRP	PCB
107	FT¹ <i>Forward Throw</i>	50 MH 35 HPS²	120³	BRP	F
		70 MH 50 HPS	277³	BLP	PCB
107EM	WT¹ <i>Wide Throw</i>	100 MH 70 HPS	347 <i>(HID only)</i>	WP	QS
<i>Emergency Sconce</i> <i>(42TRF/226QF w/MT only)</i> <i>(120V or 277V only)</i>		150 MH 100 HPS	<i>(N/A w/EM,EMR)</i>	NP	Q924
	MT <i>Medium Throw</i>	175 MH 150 HPS		BGP	SL
107EMR		<u>120V through 277V Only³</u>		OC	UT
<i>Remote Emergency Sconce</i> <i>(42TRF/226QF/242TRF</i> <i>w/MT only)</i> <i>(120V or 277V only)</i>		26 QF		SC	WS
	1. Not available with fluorescent lamps	(2) 26 QF			WS/UT
	2. 120V only	32 TRF			B84C
	3. 26QF, 32TRF and 42TRF types feature an electronic fluorescent ballast that accepts 120V through 277V, 50hz or 60hz input.	42 TRF			
		(2) 42 TRF			
		<i>(MT only: N/A with EM)</i>			
		<u>120V Only</u>			
		(2) 26 QF-DIM			
		42 TRF-DIM			

QF Quad Tube Fluorescent
TRF Triple Tube Fluorescent
*DIM Dimming Ballast (see below for recommended controls)
Fluorescent available with MT optics only

Recommended Dimmer Controls:

Other controls are available, please contact ESI for listing.
Derate the power by 80%.
For example, a 100 watt dimmer may only drive 80w of these ballasts.

DIM-E REVERSED PHASE CONTROL

Lightolier	Rated Power
ZP260ESI	260w
ZP425ESI	425w
OS300ESI	300VA
OH500ESI	500VA
MP525ESI	525w
MP625ESI	625w

FINISH:

BRP	Bronze Paint
BLP	Black Paint
WP	White Paint
NP	Natural Aluminum Paint
BGP	Beige Paint
OC	Optional Color Paint Specify RAL designation as shown in Color Selection Guide. ex: OC-RAL7024
SC	Special Color Paint (Specify: Must supply color chip)

OPTIONS:

F	Fusing (120V/277V only)
PCB	Button Type Photocontrol (120V/277V only)
QS	Quartz Standby (HID, WT Optics only)
Q924	Quartz Emergency (HID, WT Optics only. 150w max.)
SL	Solite® Diffusing Lens
UT	5° Uptilt
WS	Wall Mounted Box for Surface Conduit
WS/UT	Wall Mounted Box for Surface Conduit with 5° Uptilt
B84C	Bodine Remote Emergency Pack (107EMR luminaire only)

TYPE	PREFIX	DISTRIBUTION	WATTAGE	VOLTAGE	FINISH	OPTIONS

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79115-102703

100 LINE

107 GULLWING SCONCE

SPECIFICATIONS

GENERAL: Each Gardco 107 Line luminaire is a wall mounted cutoff luminaire for high intensity discharge or compact fluorescent lamps. Internal components are totally enclosed in a rain-tight, dust-tight and corrosion resistant housing. The housing, back plate and door frame are die cast aluminum. A choice of three (3) optical systems is available. Luminaires are suitable for wet locations (damp locations if inverted).

HOUSING: Housings are diecast aluminum. A memory retentive gasket seals the housing to the door frame to exclude moisture, dust, insects and pollutants from the optical system. A black, die cast ribbed backplate dissipates heat for longer lamp and ballast life.

DOOR FRAME: A single-piece die cast aluminum door frame integrates to the housing form. The door frame is hinged closed and secured to the housing with two (2) captive stainless steel fasteners. The heat and impact resistant 1/8" tempered glass lens and one-piece gasket are mechanically secured to the door frame with four (4) galvanized steel retainers.

OPTICAL SYSTEMS: Reflectors are composed of specular extruded and faceted Alzak components, electropolished, anodized and sealed. Reflector segments are set in arc tube image duplicating patterns to achieve the wide throw, forward throw or medium throw downlight distributions.

ELECTRICAL: Standard Luminaires: Each high power factor ballast is the separate component type, capable of providing reliable lamp starting down to -20° F. Component-to-component wiring within the luminaire will carry no more than 80% of rated current and is listed by UL for use at 600 VAC at 150°C or higher. Plug disconnects are listed by UL for use at 600 VAC, 15A or higher.

Standard and dimming fluorescent units have a starting temperature of 0°F (-18°C). Dimming range is 15% to 100% Standard fluorescent ballasts are solid state.

EM Luminaires: Electronic fluorescent ballasts are high power factor. Sockets are high temperature polycarbonate with brass contacts. In the event of power interruption, integral battery pack will power (1) 42W or (2) 26W compact fluorescent lamps at reduced light levels. Maintenance free battery is rated for ambient temperatures down to 0°C. Indicator light is visible through the lens. A test switch is accessible through the door assembly.

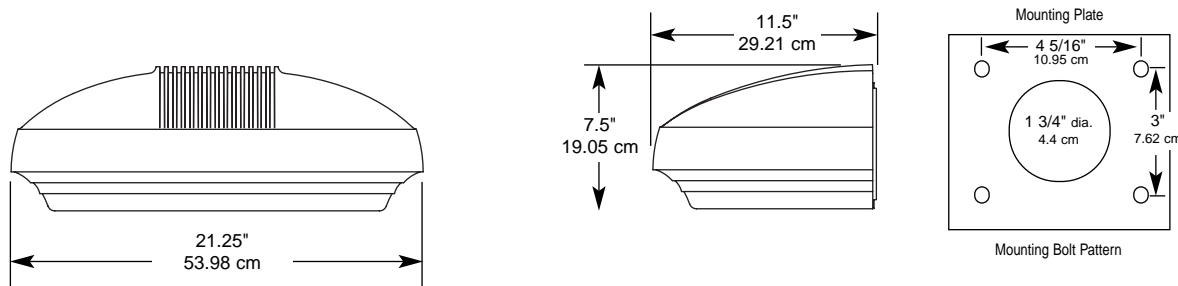
EMR Luminaires: Electronic fluorescent ballasts are high power factor. Sockets are high temperature PBT with brass contacts. A 7.5', 11 wire, quick disconnect assembly is provided for wiring through conduit (by others) to a Bodine B84C fluorescent emergency ballast. The B84C fluorescent emergency ballast is not provided by Gardco unless the B84C Option is specified on the order to the factory. In the event of power interruption, The remote battery pack (B84C) will power (1) 42W or (2) 26W compact fluorescent lamp at reduced light levels. Maintenance free battery is rated for ambient temperatures down to 0°C. Indicator light is visible through the lens. A test switch is accessible through the door assembly.

LAMPHOLDER: Pulse rated medium base sockets are glazed porcelain with nickel plated screw shell. Fluorescent sockets are high temperature plastic (PBT) with brass alloy contacts.

FINISH: Each standard color luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) textured polyester powdercoat finish. Standard colors include bronze (BRP), black (BLP), white (WP), natural aluminum (NP) and beige (BGP). Consult factory for specs on custom colors.

LABELS: All luminaires bear either UL or CUL (where applicable) Wet Location labels. Lens down application is Wet Location and lens up is Damp Location.

DIMENSIONS



Note: Mounting plate center is located in the center of the luminaire width and 3.5" above the luminaire bottom (lens down position). Splices must be made in the J-box (by others). Mounting plate must be secured by max. 5/16" diameter bolts (by others) structurally to the wall.

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79115-102/703

BOLLARD

BRM824/825/827 BEVELED TOP LOUVER

GENERAL DESCRIPTION: Gardco's bevel top Louver Bollard provides uniform illumination, superior spacings and solid vandal resistance. Rugged extruded and cast construction with silicone seals and gasketing assure years of trouble-free service. The BRM824 is a complete assembly with an extruded aluminum base. The BRM825 head only unit affixes to custom architectural elements. The BRM827 series includes a concrete base assembly. Each luminaire utilizes 35W through 100W high intensity discharge or 32w triple-tube compact fluorescent lamps.



ORDERING

PREFIX	HEIGHT	WATTAGE	VOLTAGE	FINISH	OPTIONS
BRM824 w/Extruded Aluminum Base	42" 36" 30"	100MH 50MH (120/277V Primary only) 70MH 100MH	277 120 208 240 277	BRP BRP BLP WP NP VP OC SC	F F SHD DUP GFCI
BRM825 Head Only	11"	35HPS (120V Primary only) 50HPS (120/277V Primary only) 70HPS 100HPS			
BRM827 w/Natural Concrete Base	42"	INC (100w Maximum A19) (120V Primary only) 32TRF^{1,2} (120V through 277V only)			
BRM827B w/Beige Concrete Base					
BRM827G w/Grey Concrete Base					

1. 32TRF type features an electronic fluorescent ballast that accepts 120V through 277V, 50hz or 60hz input.
2. 0°F starting temperature

FINISH:

BRP	Bronze Paint
BLP	Black Paint
WP	White Paint
NP	Natural Aluminum Paint
VP	Verde Green Paint
OC	Optional Color Paint Specify RAL designation as shown in Color Selection Guide. ex: OC-RAL7024
SC	Special Color Paint Specify. Must supply color chip

OPTIONS:

F	Fusing
SHD	Internal 180° Shield
DUP	Duplex Receptacle*
GFCI	GFCI Receptacle*

*weathertight, flush-mounted in lower housing - BRM824 only

TYPE	PREFIX	OPTICS	HEIGHT	WATTAGE	VOLTAGE	FINISH	OPTIONS

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510/357-6900 in California
Fax: 510/357-3088
sitelighting.com

Genlyte Thomas Group LLC



79115-121/1002

BOLLARD

BRM824/825/827 BEVELED TOP LOUVER

SPECIFICATIONS

UPPER HOUSING: Diecast aluminum bevel top secures to one-piece louvered casting with three (3) concealed tamper resistant screws.

LOWER HOUSING:

BRM824 Luminaire features a cylindrical .125 wall 6063-T5 extruded aluminum base housing. Bottom section has a welded-in cast ring for attachment to base assembly with four (4) hex head set screws.

BRM825 Louver head assembly is affixed to ballast mounting bracket which is suitable for insertion into architectural elements (by others).

BRM827 Luminaire includes a pre-cast concrete base constructed with steel molds and wire reinforcing. Base is acid-etched to provide a smooth textured aggregate finish.

OPTICAL SYSTEM: Louvers are angled to provide maximum spacings while shielding the source to 90°. Upper louver features a concealed hammer-toned anodized aluminum reflector to increase luminaire efficiency and generate unstriated beam patterns. A fully gasketed Pyrex vessel enshrouds the lamp envelope and is secured with a stainless steel spring.

SOCKET: Medium base pulse-rated lampholder is glazed porcelain with nickel plated reinforced screw shell and spring loaded contact.

ANCHORAGE:

BRM824 Base assembly consists of a cast aluminum platform and ballast mounting bracket. Assembly is secured and leveled to the mounting foundation with four (4) 3/8" X 9" x 1 1/2" anchor bolts on a 4 3/4" bolt circle. Ballast is prewired with quick electrical disconnects and mounting bracket is secured with two (2) Phillips head screws for ease of installation and servicing.

BRM825 Mounting plate is cast aluminum with slots to accept anchor bolts (by others) at 90° on a 6 1/4" diameter bolt circle. A 4 1/2" diameter opening is required to house ballast assembly.

BRM827 Base assembly consists of four (4) galvanized steel base tabs fastened to pre-cast concrete base. Assembly is secured and leveled to the mounting foundation with four (4) 3/8" X 9" X 1 1/2" anchor bolts on a 9 1/2" bolt circle. Base is designed for 5" direct burial.

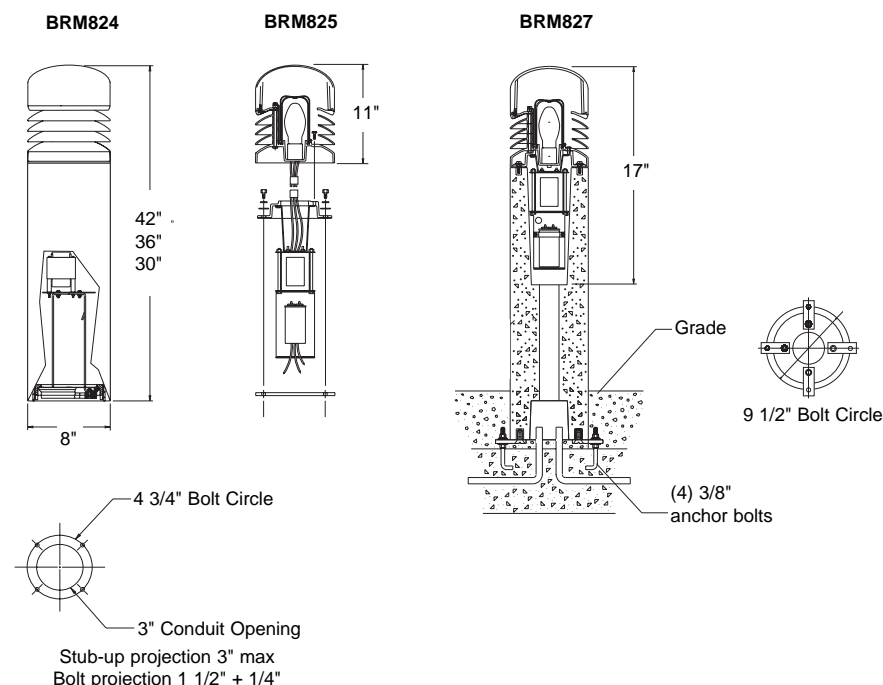
ELECTRICAL: Each high power factor ballast is the separate component type, capable of providing reliable lamp starting down to -20° F. Component-to-component wiring within the luminaire will carry no more than 80% of rated current and is listed by UL for use at 600 VAC at 150°C or higher. Plug disconnects are listed by UL for use at 600 VAC, 15A or higher.

All fluorescent luminaires utilize electronic ballasts that are high power factor and designed for reliable lamp starting to 0°F. Smart fluorescent ballasts accept 32w in all voltages from 120 to 277, 50/60Hz. Sockets are high temperature PBT with brass contacts.

LUMINAIRE FINISH: Each luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured textured powdercoat finish.

LABELS: All fixtures bear UL or CUL (where applicable) Wet Location labels.

DIMENSIONS



NOTE: Factory supplied template must be used when setting anchor bolts. Gardco Lighting will not honor any claim for incorrect anchorage placement from failure to use factory supplied templates.

Gardco Lighting reserves the right to change materials or modify the design of its product without notification as part of the company's continuing product improvement program.

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







79115-121/1002

ATTACHMENT D

MODEL RESULTS FOR THE ROUTE 9 54-MGD PLANT

Brightwater - Route 9 Site

Luminaire Schedule						
Project: All Projects						
Symbol	Qty	Label	Arrangement	Lumens	LLF	Description
	12	W7	SINGLE	5000	0.684	WALL PACK 70W MH
	24	S1	SINGLE	13500	0.684	POLE LIGHT M-S-III, 150 W MH
	27	S2	SINGLE	22500	0.684	POLE LIGHT M-S-II, 250 W MH
	2	S22	BACK-BACK	22500	0.684	POLE LIGHT M-S-II, 2-250 W MH
	59	SB7	SINGLE	1000	0.855	BOLLARD, 42 IN 70W MH, V
	10	S12	BACK-BACK	13500	0.684	POLE LIGHT M-S-III, 2-150 W MH
	23	W15	SINGLE	12800	0.684	WALL PACK 150W MH

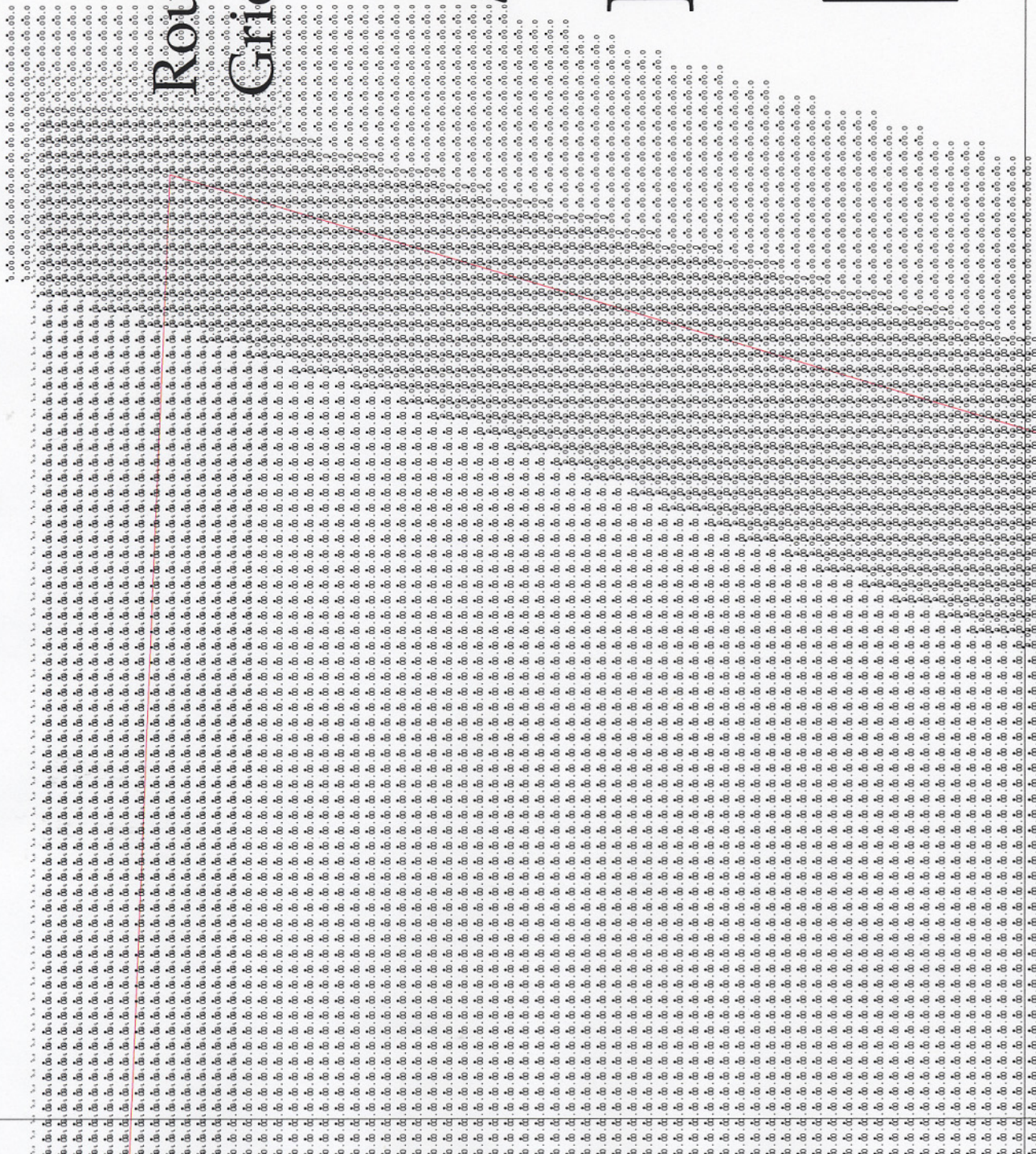
Numeric Summary - Basic						
Project: All Projects						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
Westside	Illuminance	Lux	0.36	22.3	0.0	0.00
North	Illuminance	Lux	0.00	0.0	0.0	0.00
Site	Illuminance	Lux	1.84	68.4	0.0	0.00
East	Illuminance	Lux	0.47	42.1	0.0	0.00

Route 9

Grid: A-1

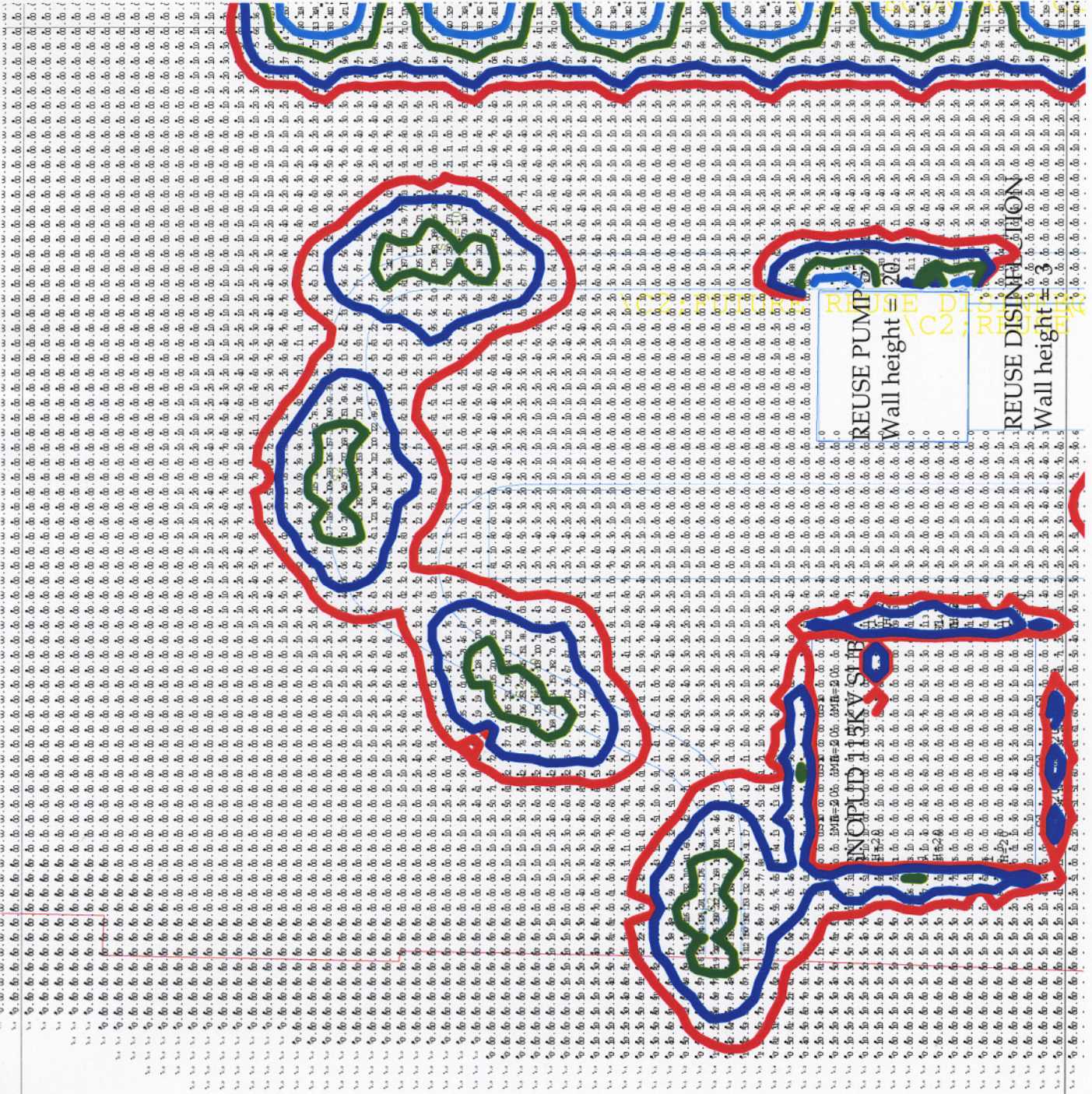
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Route 9 Grid: B-1



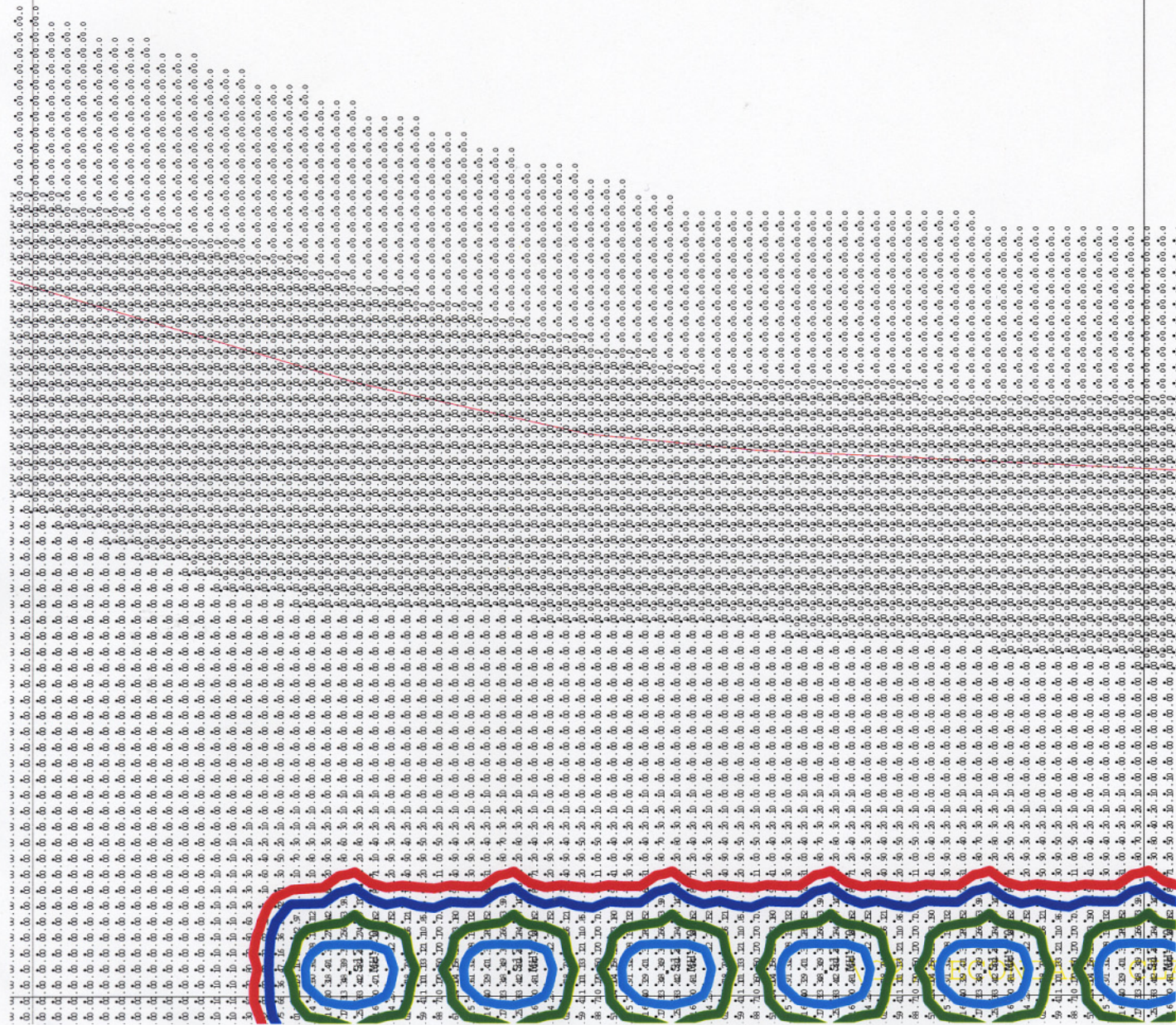
Route 9

Grid: A-2

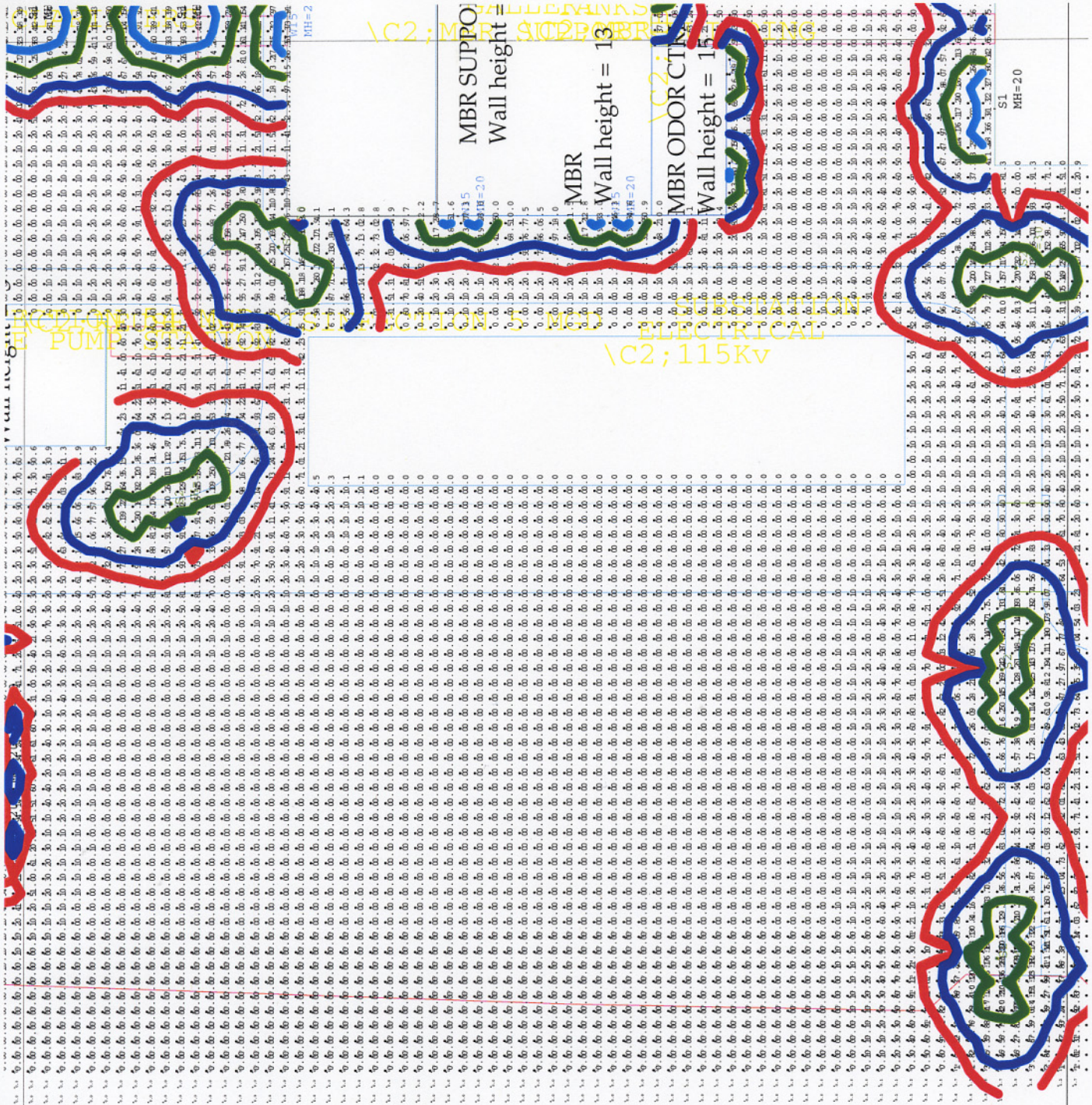


Route 9

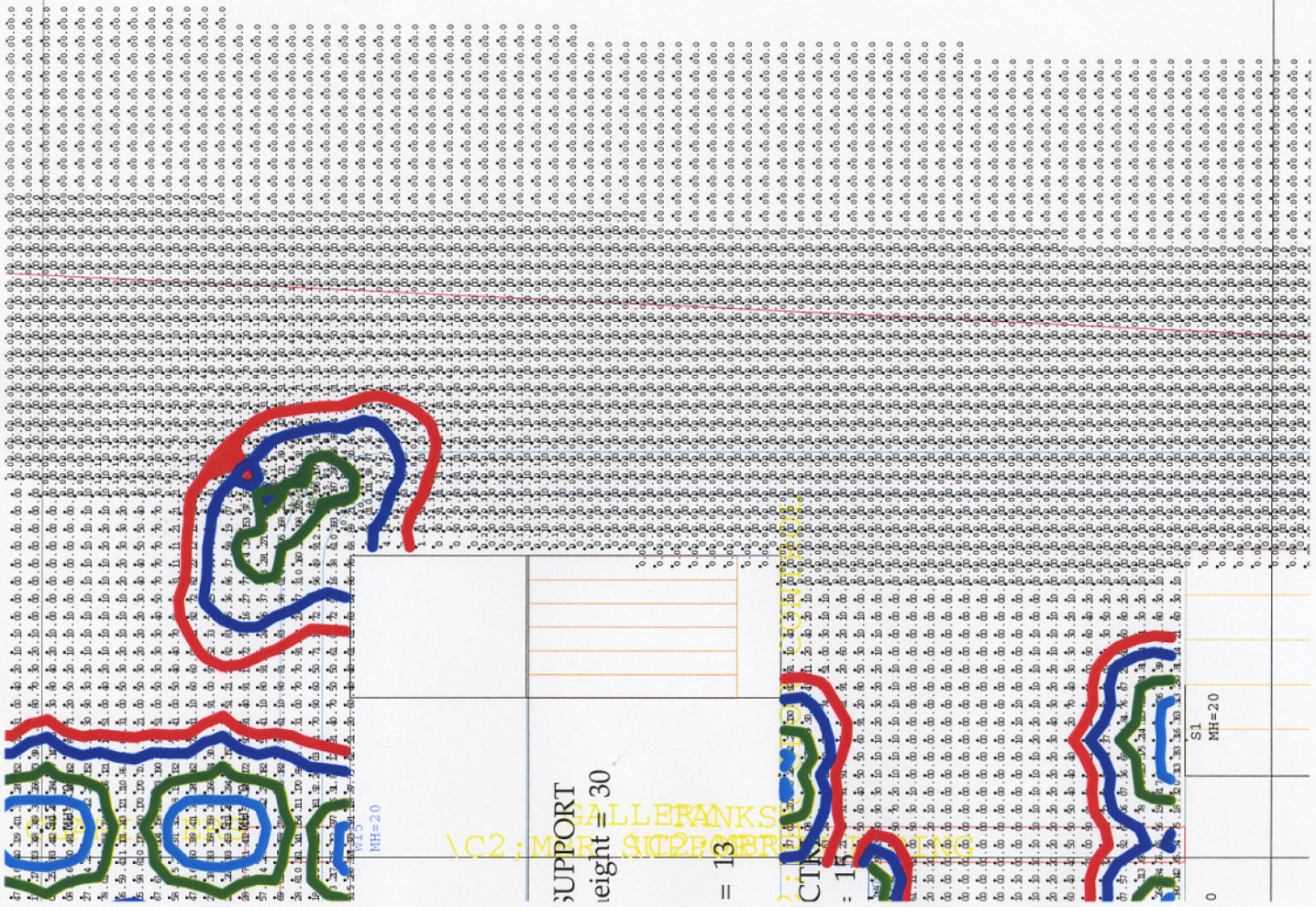
Grid: B-2



Route 9 Grid: A-3



Route 9 Grid: B-3



Route 9 Grid: A-4

AERATION
Wall height = 6'

GALLERY

\C2; AERATION BASINS

AERATION OD
Wall height = 11'

FINE SCR
Wall height = 11'

C2; FINE SCR
Wall height = 11'

387
M11-353

ION
eight = 9

GALLERY

\C2; AERATION BASINS

ION IODORIC TR

ghc=15



NE SCREENINGS

all height = 40

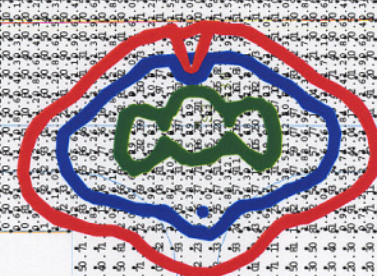
C2

11

11

11

Route 9 Grid: B-4



Route 9 Grid: A-5

PRI CLARIFI
Wall height = 27

ADMIN 1
Wall height = 27

PRI PRUDO
Wall height = 27

ADMIN 2
Wall height = 20

COMMUNITY CENTER

Wall height = 20

MAINTENANCE

Wall height = 30

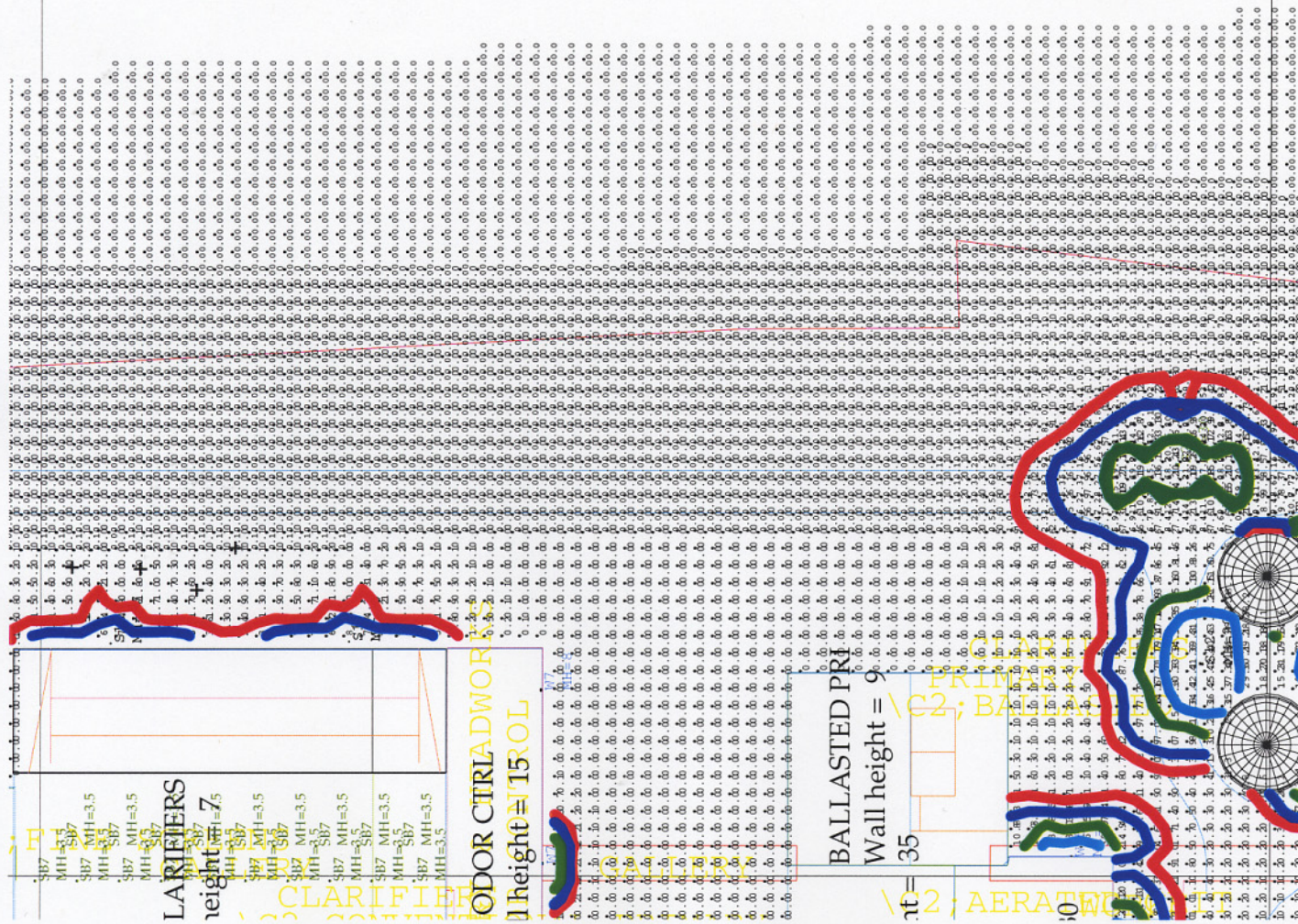
CRIT

Wall height = 3

HEADWORKS

Wall height = 30

Route 9
Grid: B-5



Route 9 Grid: A-6

IPS

Wall height = 20

Solids Building
Wall height = 40

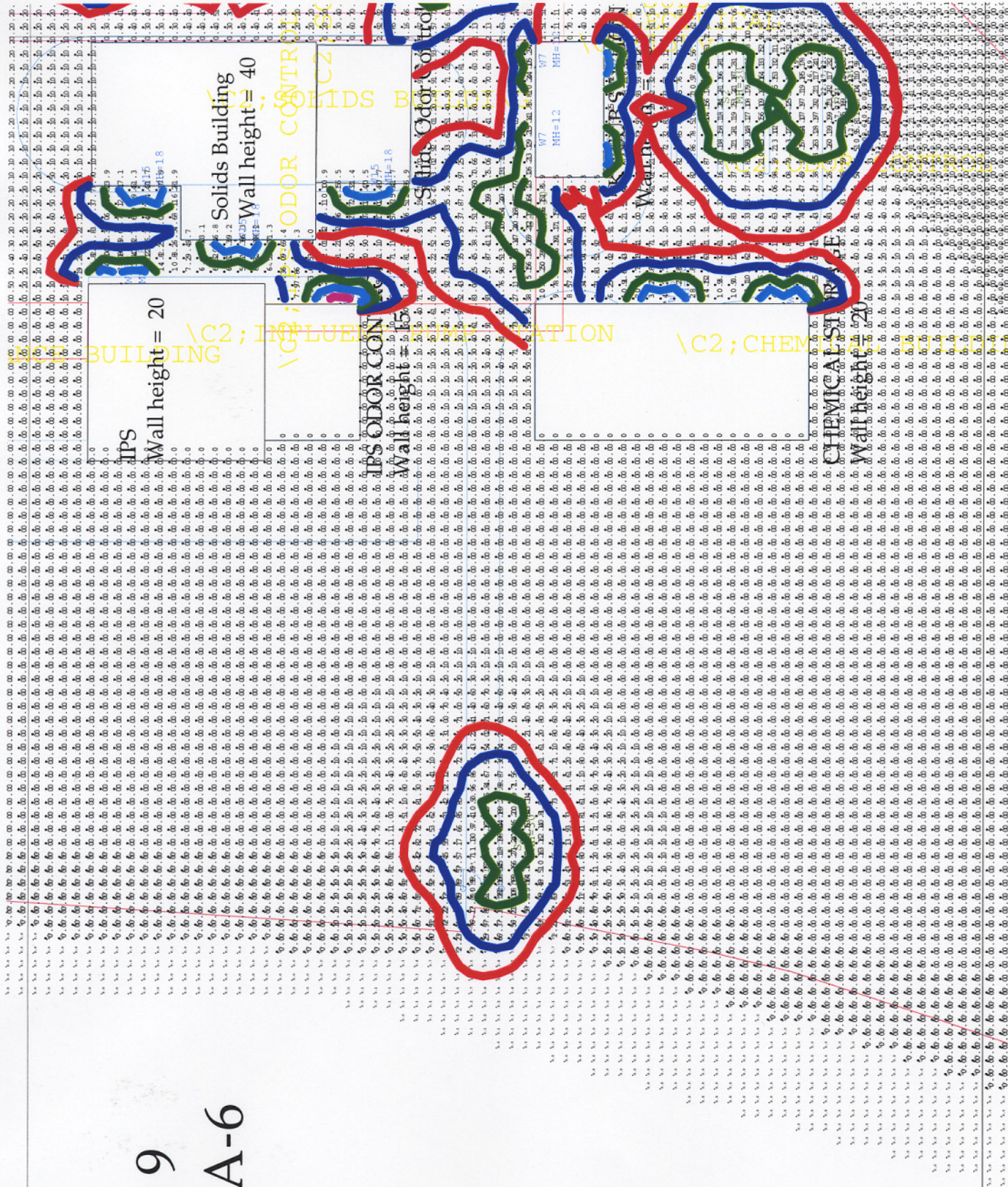
IPS ODOR CON

Wall height = 15

Solids Odor Control

CHEMICAL STORAGE

Wall height = 20

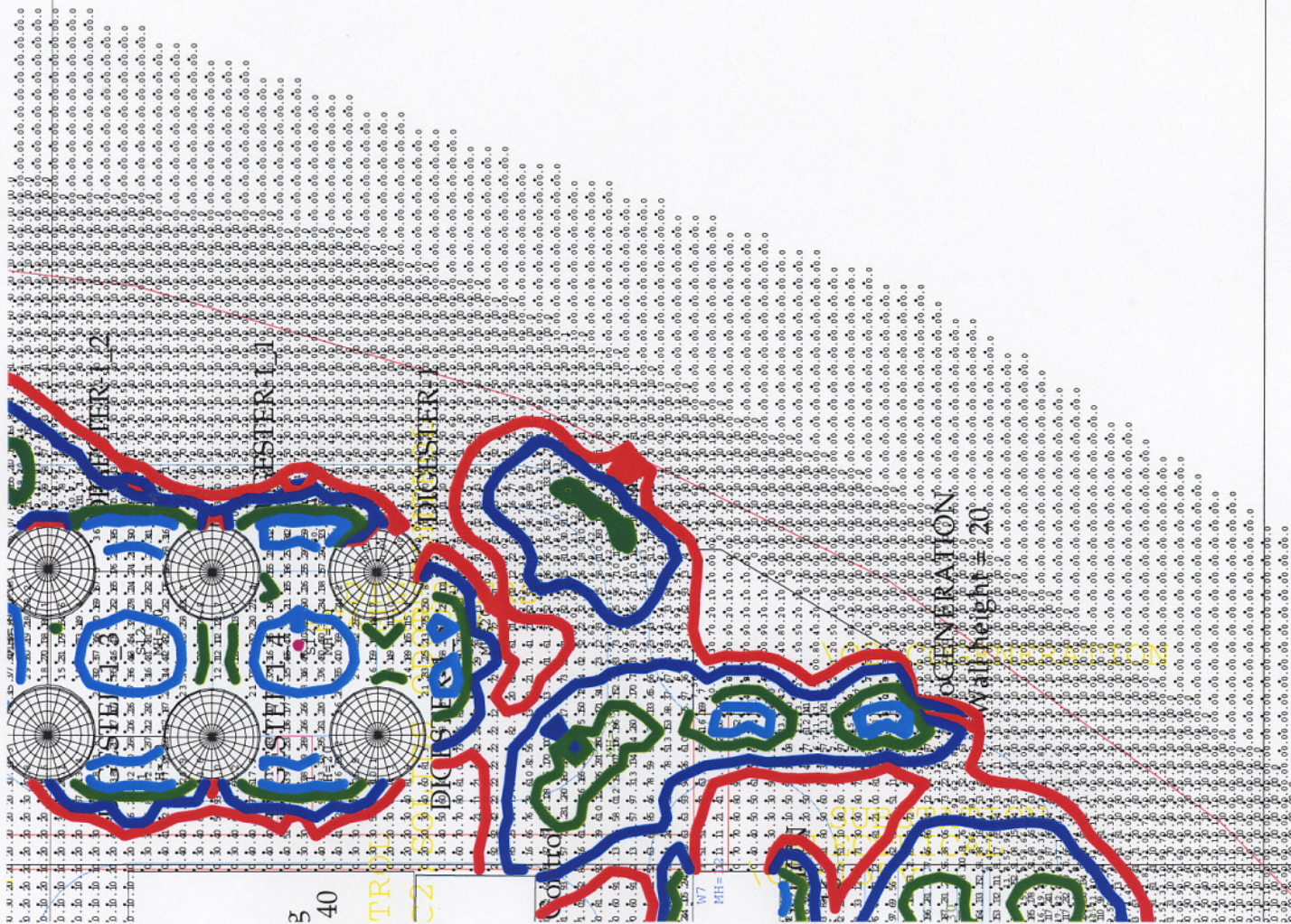


Route 9 Grid: B-6

ISO LINE VALUES

- 2 Lux
- 5 Lux
- 15 Lux
- 30 Lux
- 50 Lux

Date: 0



Route 9

Grid: A-7

Route 9 Grid: B-7

Brightwater - Route 9 Site

Luminaire Schedule						
Project: All Projects						
Symbol	Qty	Label	Arrangement	Lumens	LLF	Description
	12	W7	SINGLE	5000	0.684	WALL PACK 70W MH
—□	24	S1	SINGLE	13500	0.684	POLE LIGHT M-S-III, 150 W MH
—□	27	S2	SINGLE	22500	0.684	POLE LIGHT M-S-II, 250 W MH
□	2	S22	BACK-BACK	22500	0.684	POLE LIGHT M-S-II, 2-250 W MH
□	59	SB7	SINGLE	1000	0.855	BOLLARD, 42 IN 70W MH, V
□	10	S12	BACK-BACK	13500	0.684	POLE LIGHT M-S-III, 2-150 W MH
	23	W15	SINGLE	12800	0.684	WALL PACK 150W MH

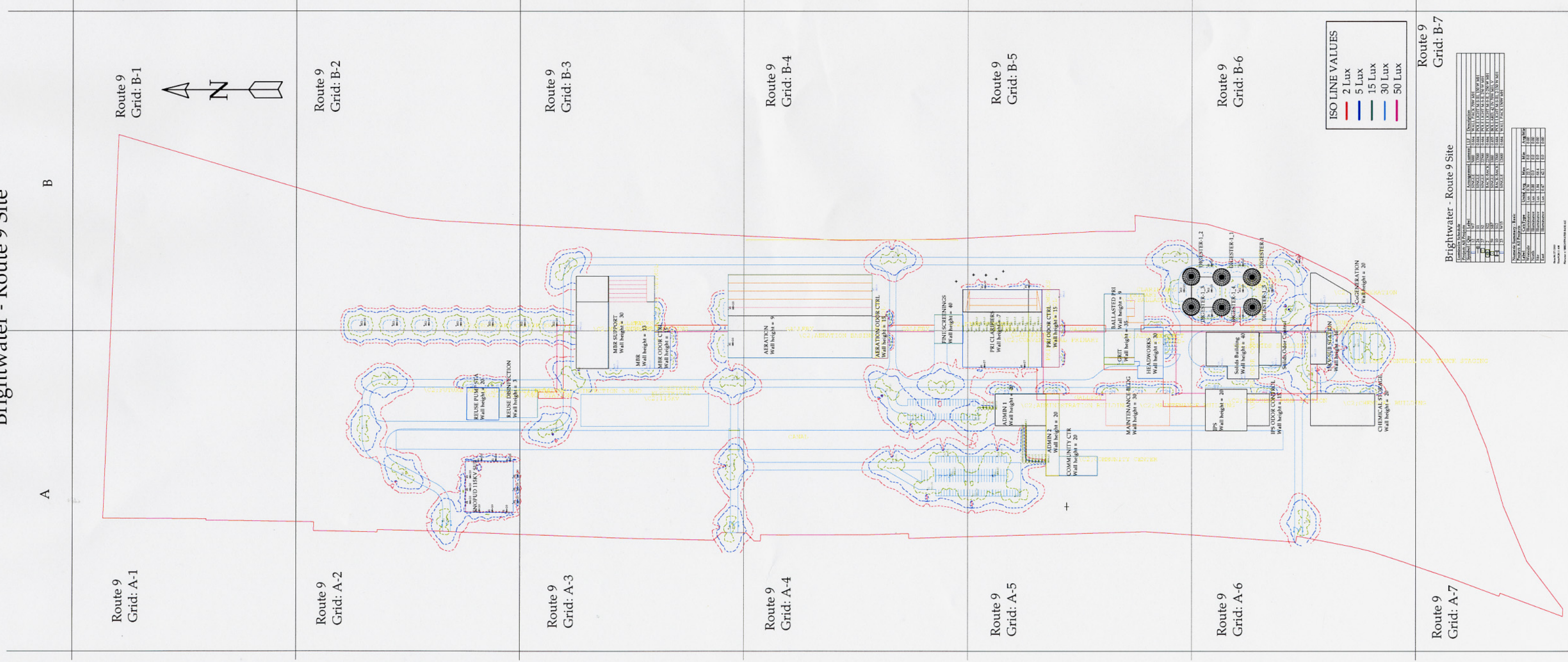
Numeric Summary - Basic						
Project: All Projects						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
Westside	Illuminance	Lux	0.36	22.3	0.0	0.00
North	Illuminance	Lux	0.00	0.0	0.0	0.00
Site	Illuminance	Lux	1.84	68.4	0.0	0.00
East	Illuminance	Lux	0.47	42.1	0.0	0.00

Date:08/26/2003

Time:10:33:46 AM

Filename: n:\BRIGHTWATER-BASE.A32

Brightwater - Route 9 Site



Runway Schedule			Arrangement		Description	
Port	Arr	Depart	Runway	Altitude	Runway	Altitude
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99	99	99	99	99	99	99
100	100	100	100	100	100	100





Numeric Summary - Basic						
Projects All Projects						
Label	Category	Units	Avg	Max	Min	Avg/Min
Wholesale	Wholesale	1 us	0.36	22.3	0.0	0.00
North	Wholesale	1 us	0.00	0.0	0.0	0.00
Sale	Wholesale	1 us	1.04	68.4	0.0	0.00
East	Wholesale	1 us	0.47	42.1	0.0	0.00

Downloaded At: 11:53 11 September 2009

ATTACHMENT E

MODEL RESULTS FOR THE UNOCAL 72-MGD PLANT

Brightwater Unocal Site option

Luminaire Schedule						
Project: All Projects						
Symbol	Qty	Label	Arrangement	Lumens	LLF	Description
	8	SB7	SINGLE	1000	0.855	BOLLARD, 42 IN 50W MH, V
	47	W7	SINGLE	5000	0.767	WALL PACK 70W MH
	28	W17	SINGLE	12800	0.684	WALL PACK 150W MH
	42	S1	SINGLE	13500	0.684	POLE LIGHT M-S-III, 150 W MH

Numeric Summary						
Project: All Projects						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
S2	Illuminance	Lux	0.00	0.0	0.0	0.00
C1 FACILITY LOWER	Illuminance	Lux	4.23	66.9	0.0	0.00
C1 FACILITY UPPER	Illuminance	Lux	4.90	4.9	4.9	1.00
B2 FACILITY UPPER	Illuminance	Lux	4.32	53	0	0.00
B2 FACILITY LOWER	Illuminance	Lux	1.58	39	0	0.00
A2 FACILITY LOWER	Illuminance	Lux	1.01	4	0	0.00
A1 FACILITY UPPER	Illuminance	Lux	6.74	46	0	0.00
B1 FACILITY	Illuminance	Lux	4.20	129	0	0.00
C1 FACILITY	Illuminance	Lux	1.70	65	0	0.00
C2 FACILITY LOWER B	Illuminance	Lux	4.94	42	0	0.00
D2 FACILITY GRID	Illuminance	Lux	2.42	38	0	0.00
C2 FACILITY UPPER	Illuminance	Lux	5.98	48	0	0.00
S1	Illuminance	Lux	0.00	0.0	0.0	0.00
NW1	Illuminance	Lux	0.95	2.3	0.1	9.50
NW2	Illuminance	Lux	0.03	0.9	0.0	0.00
NE2	Illuminance	Lux	0.00	0.0	0.0	0.00
NE3	Illuminance	Lux	0.00	0.0	0.0	0.00
S3	Illuminance	Lux	0.00	0.0	0.0	0.00
NE1	Illuminance	Lux	0.00	0.0	0.0	0.00
NW3	Illuminance	Lux	0.00	0.0	0.0	0.00

UNOCAL

GRID: A-1

UV DISINFECTI
PUGET SOUND I
FOR MAIN STRE

1
0.01
0.01
0.0001
0.000001
0.00000001
0.0000000001
0.000000000001
0.00000000000001
0.0000000000000001

UNOCAL GRID: B-1

ADMIRAL WAY

NW3 Grid

STORMWATER
TREATMENT FACILITY
(WET POND)

NW2 Grid

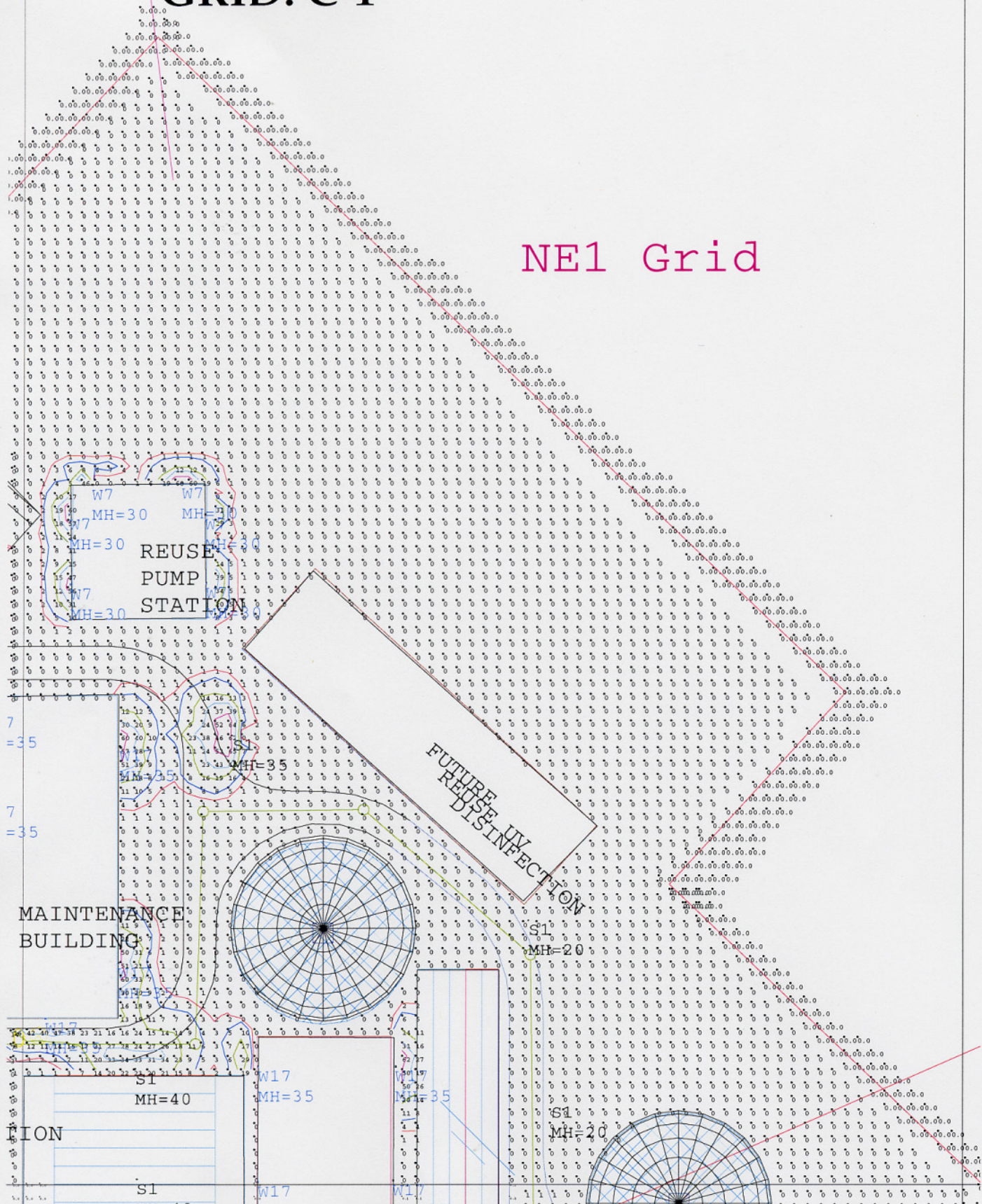
STORMWATER
DISCHARGE TO
PUGET SOUND

SECTION FOR
AND DISCHARGE
STREAM

W17
MH=30 SECONDARY
ODOR CONTROL

REUSE UV
DISINFECTION
5 MGD

NE1 Grid



UNOCAL GRID: D-1

CHEMICAL DISINFECTION
FOR PUGET SOUND DISCHARGE
FOR SPLIT STREAM

SR 104

NE? Grid

NW1 Grid

115 kV
ELECTRIC
SUBSTATION

RETAINING
WALL

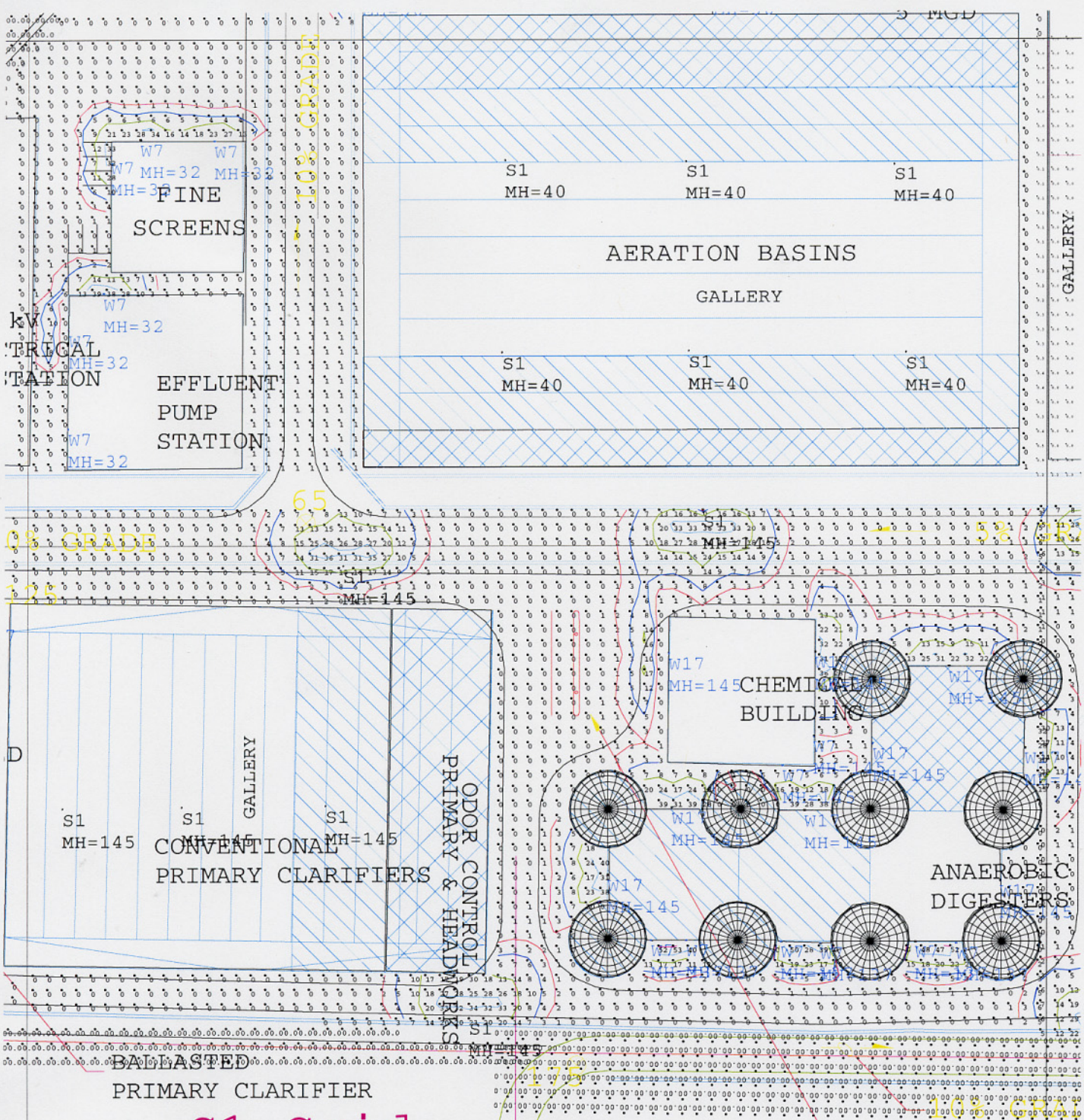
ODOR
CONTROL
FOR IPS

GALLERY
AERATED
GRIT

INFLUENT
PUMP
STATION
(IPS)

RETAINING WALL

UNOCAL
GRID: A-2

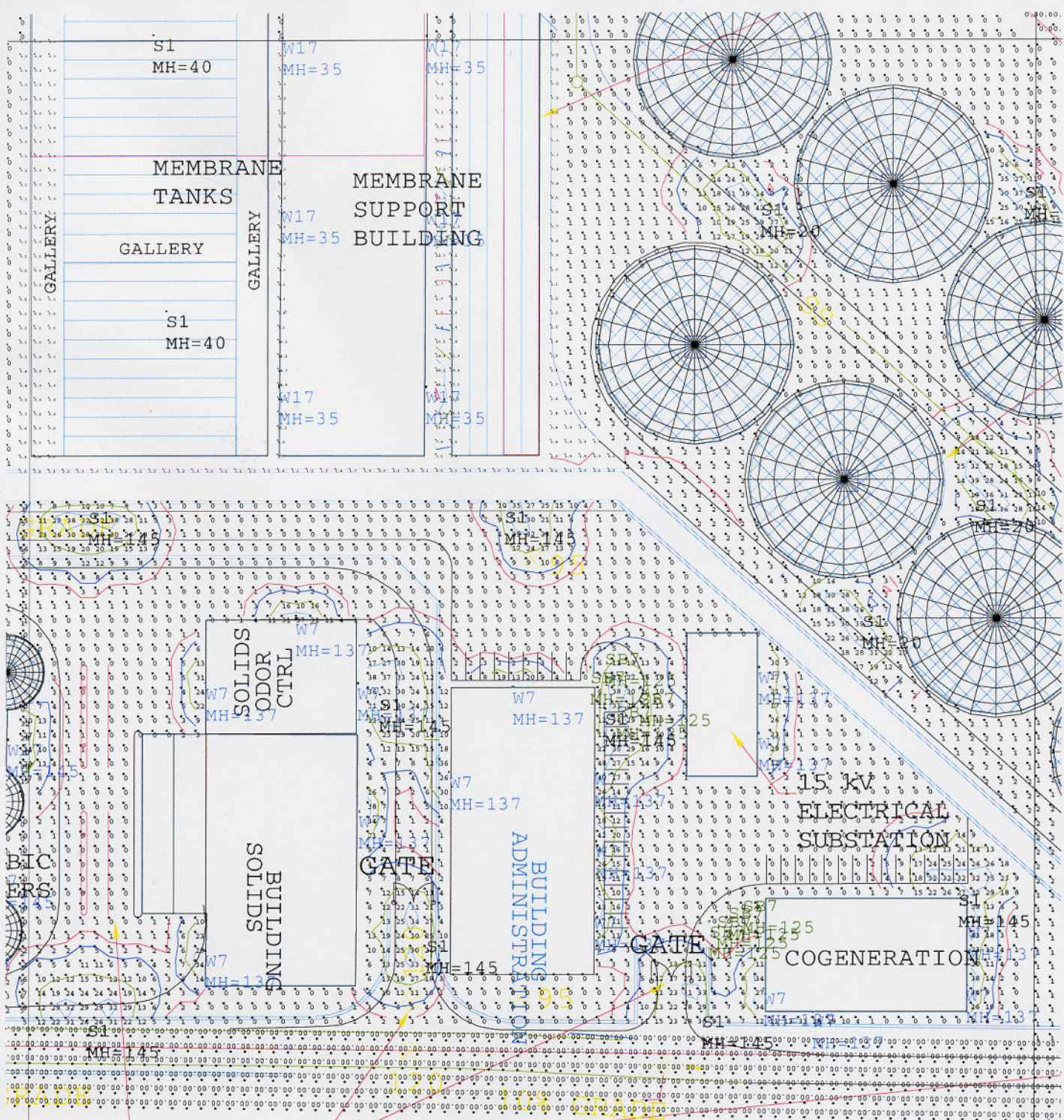


S1 Grid

PROPOSED
REALIGNED
PINE ST.

ODOR CONTROL
FOR TRUCK S'

UNOCAL
GRID: B-2



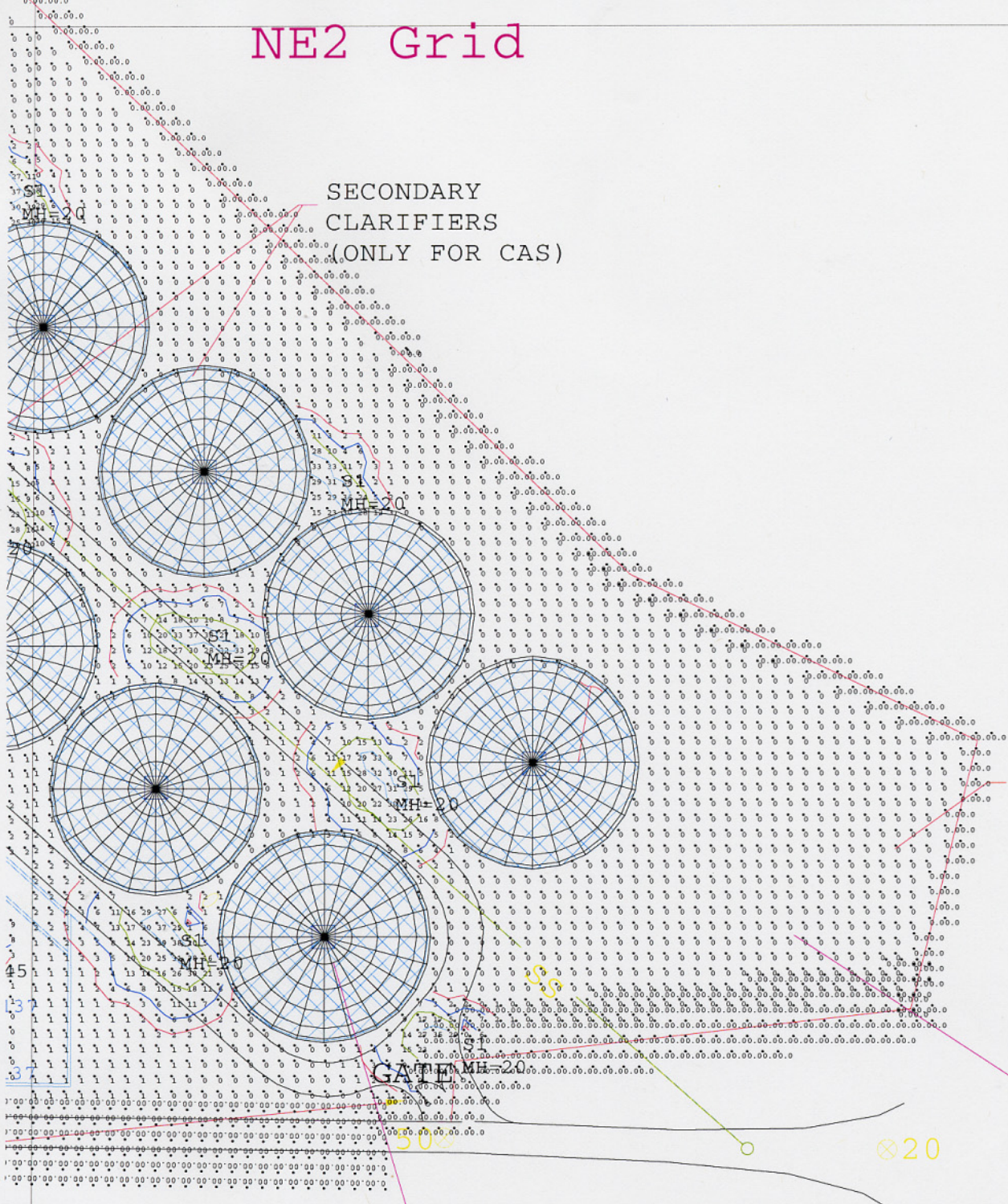
TROL PROPOSED
K STAGING ACCESS ROADS

S2 Grid

UNOCAL
GRID: C-2

NE2 Grid

SECONDARY
CLARIFIERS
(ONLY FOR CAS)

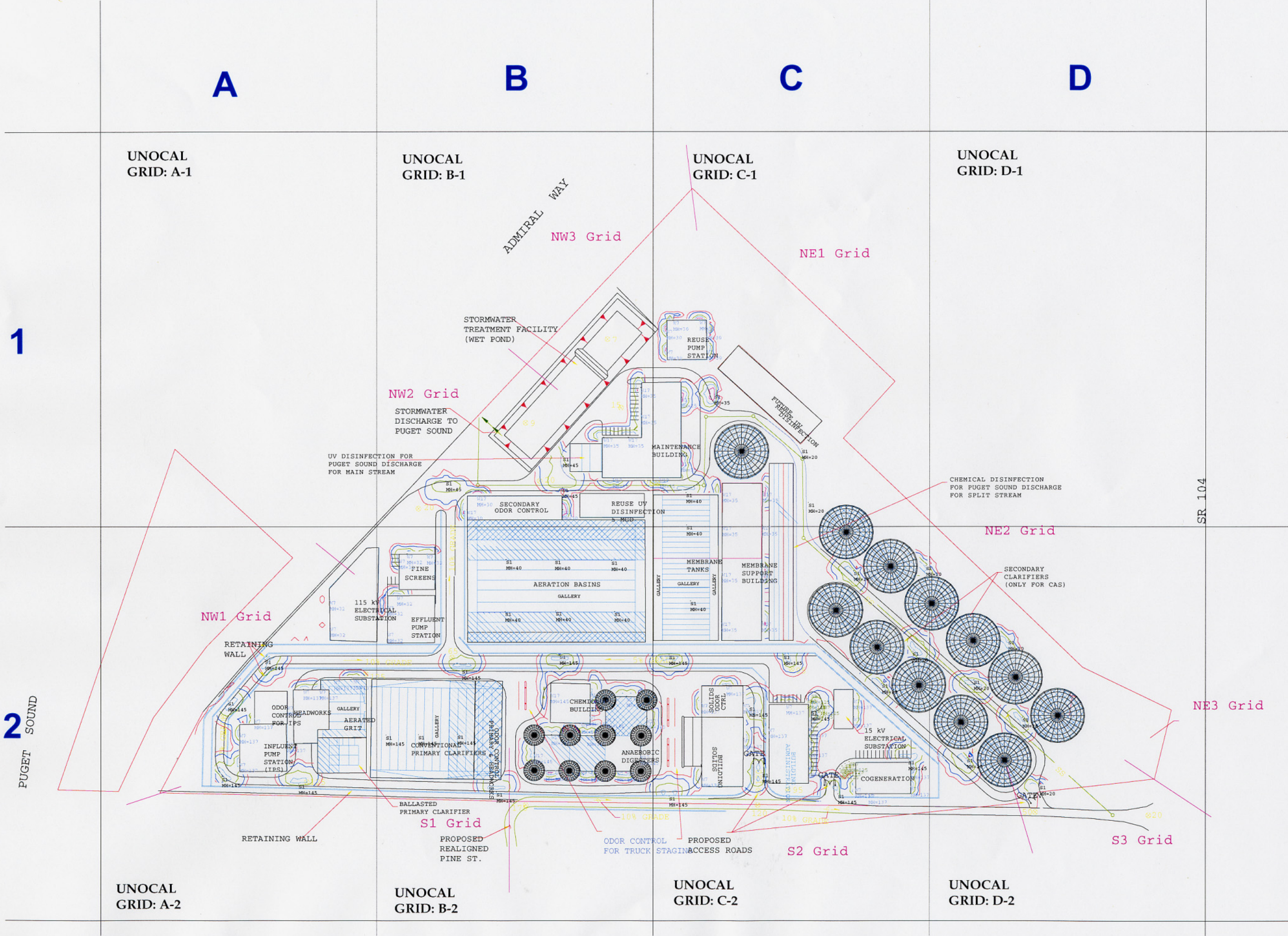


NE2

S3 Grid

UNOCAL
GRID: D-2








Brightwater Unocal Site option



ATTACHMENT F

MODEL RESULTS FOR THE 72-MGD PLANT WITH THE LID SUB- ALTERNATIVE

Brightwater Unocal LID option

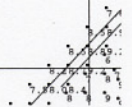
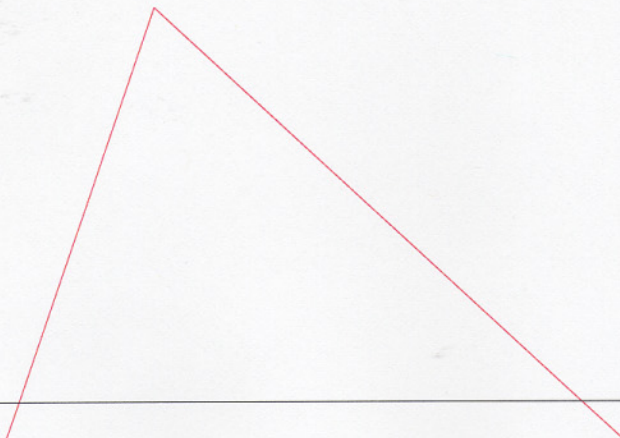
Luminaire Schedule						
Project: All Projects						
Symbol	Qty	Label	Arrangement	Lumens	LLF	Description
	8	S2	SINGLE	22500	0.684	POLE LIGHT M-S-II, 250 W MH
	22	S22	BACK-BACK	22500	0.684	POLE LIGHT M-S-II, 2-250 W MH
	13	SB7	SINGLE	1000	0.855	BOLLARD, 42 IN 50W MH, V
	38	W7	SINGLE	5000	0.767	WALL PACK 70W MH
	11	W17	SINGLE	12800	0.684	WALL PACK 150W MH
	18	S1	SINGLE	13500	0.684	POLE LIGHT M-S-III, 150 W MH
	17	S24	4 @ 90 DEGREES	22500	0.684	POLE LIGHT M-S-II, 4-250 W MH

Numeric Summary						
Project: All Projects						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
P3	Illuminance	Lux	11.55	15	5	2.31
P2	Illuminance	Lux	11.54	18	5	2.31
P1	Illuminance	Lux	13.78	23	7	1.97
NW3	Illuminance	Lux	0.86	2.1	0.0	0.00
FERRY1	Illuminance	Lux	9.97	15.8	2.2	4.53
P4	Illuminance	Lux	12.66	16.9	5.8	2.18
NW1	Illuminance	Lux	2.24	7	0	0.00
PM1	Illuminance	Lux	9.50	13	5	1.90
P6	Illuminance	Lux	10.76	15	6	1.79
DR2	Illuminance	Lux	3.62	48	0	0.00
NE1	Illuminance	Lux	0.12	2	0	0.00
NE2	Illuminance	Lux	0.42	2	0	0.00
FERRY3	Illuminance	Lux	7.51	10	4	1.88
P7	Illuminance	Lux	9.52	13	7	1.36
NE3	Illuminance	Lux	0.00	0	0	0.00
S3	Illuminance	Lux	1.51	8	0	0.00
S2	Illuminance	Lux	0.00	0	0	0.00
FERRY2	Illuminance	Lux	10.29	14	7	1.47
P5	Illuminance	Lux	12.03	15	7	1.72
E2 FACILITY	Illuminance	Lux	18.45	33	4	4.61
F2 FACILITY	Illuminance	Lux	11.08	15	9	1.23
F2 FACILITY	Illuminance	Lux	4.66	56	0	0.00
E2 FACILITY	Illuminance	Lux	6.96	47	0	0.00
G1 FACILITY	Illuminance	Lux	1.73	12	0	0.00
F1 FACILITY	Illuminance	Lux	1.88	27	0	0.00
G2 FACILITY	Illuminance	Lux	4.64	9	0	0.00
H1 FACILITY	Illuminance	Lux	2.10	36	0	0.00
NW2	Illuminance	Lux	3.23	9.4	0.7	4.61
S1	Illuminance	Lux	0.91	2.4	0.2	4.55
DR1	Illuminance	Lux	6.18	45	0	0.00
G2 FACILITY	Illuminance	Lux	0.00	0	0	0.00

UNOCAL - LID
GRID: E-1

ISO LINE VALUES

-  2 Lux
-  5 Lux
-  15 Lux
-  30 Lux
-  50 Lux



UNOCAL - LID GRID: F-1

ADMIRAL
WAY

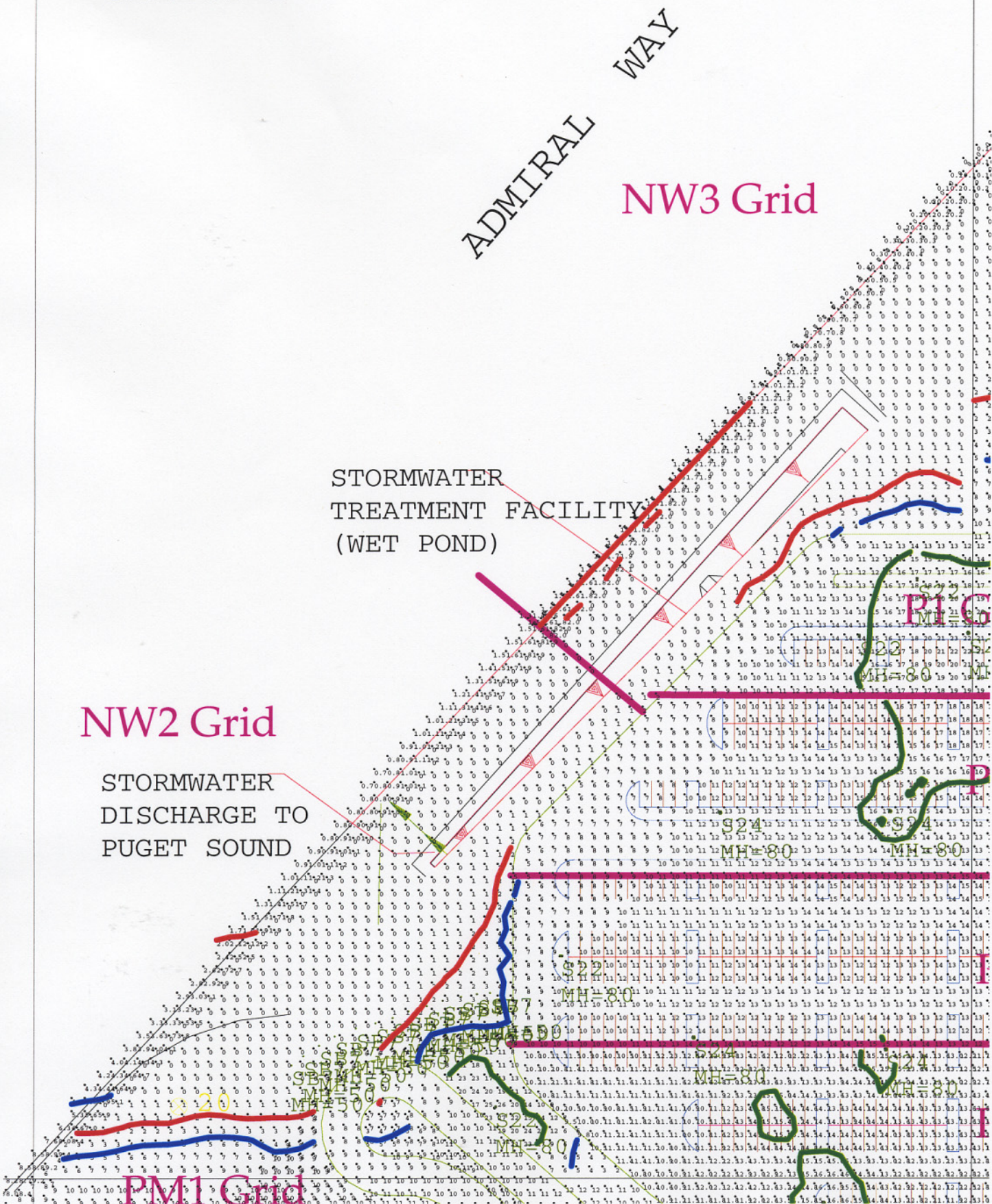
NW3 Grid

STORMWATER
TREATMENT FACILITY
(WET POND)

NW2 Grid

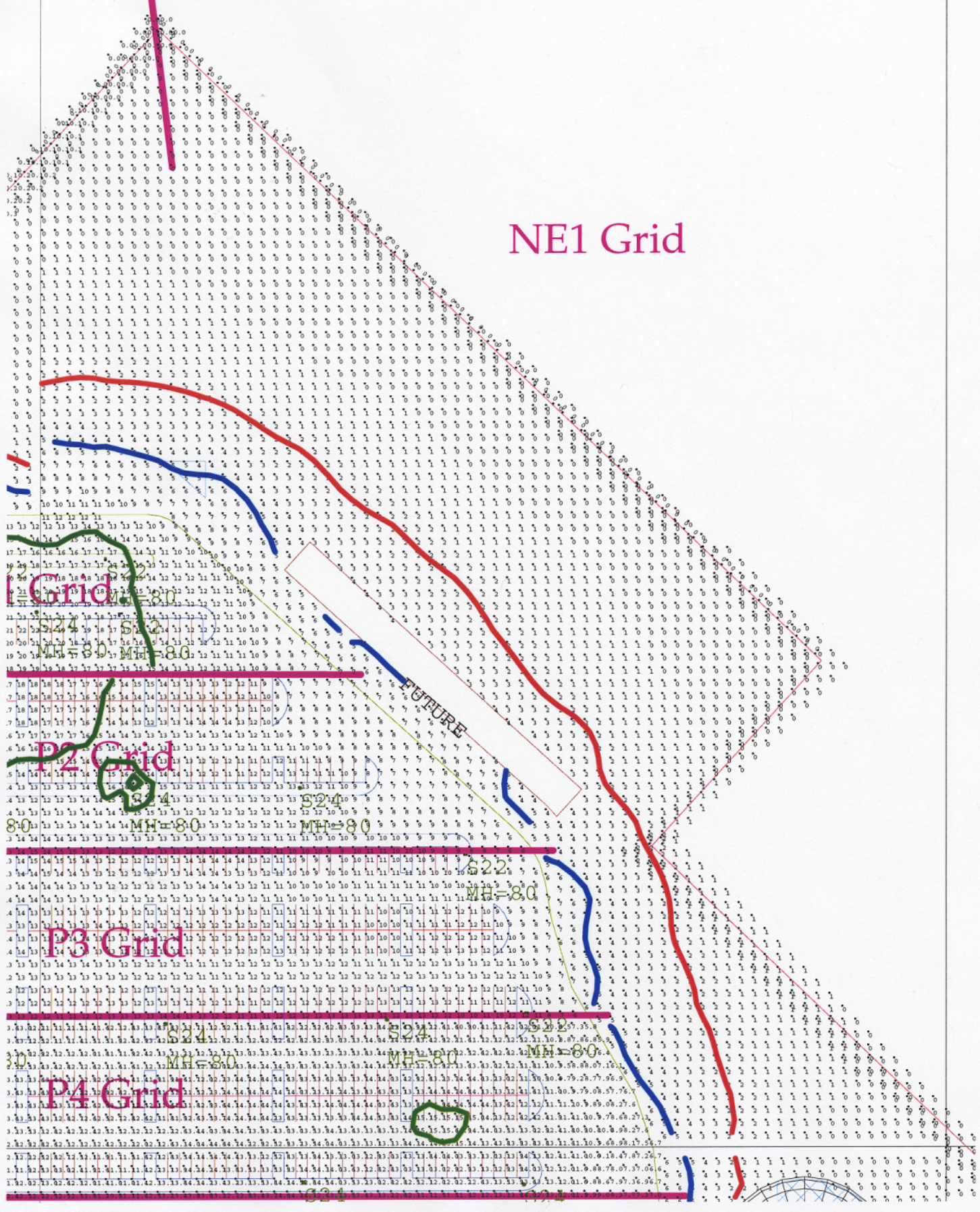
STORMWATER
DISCHARGE TO
PUGET SOUND

PM1 Grid



UNOCAL - LID GRID: G-1

NE1 Grid

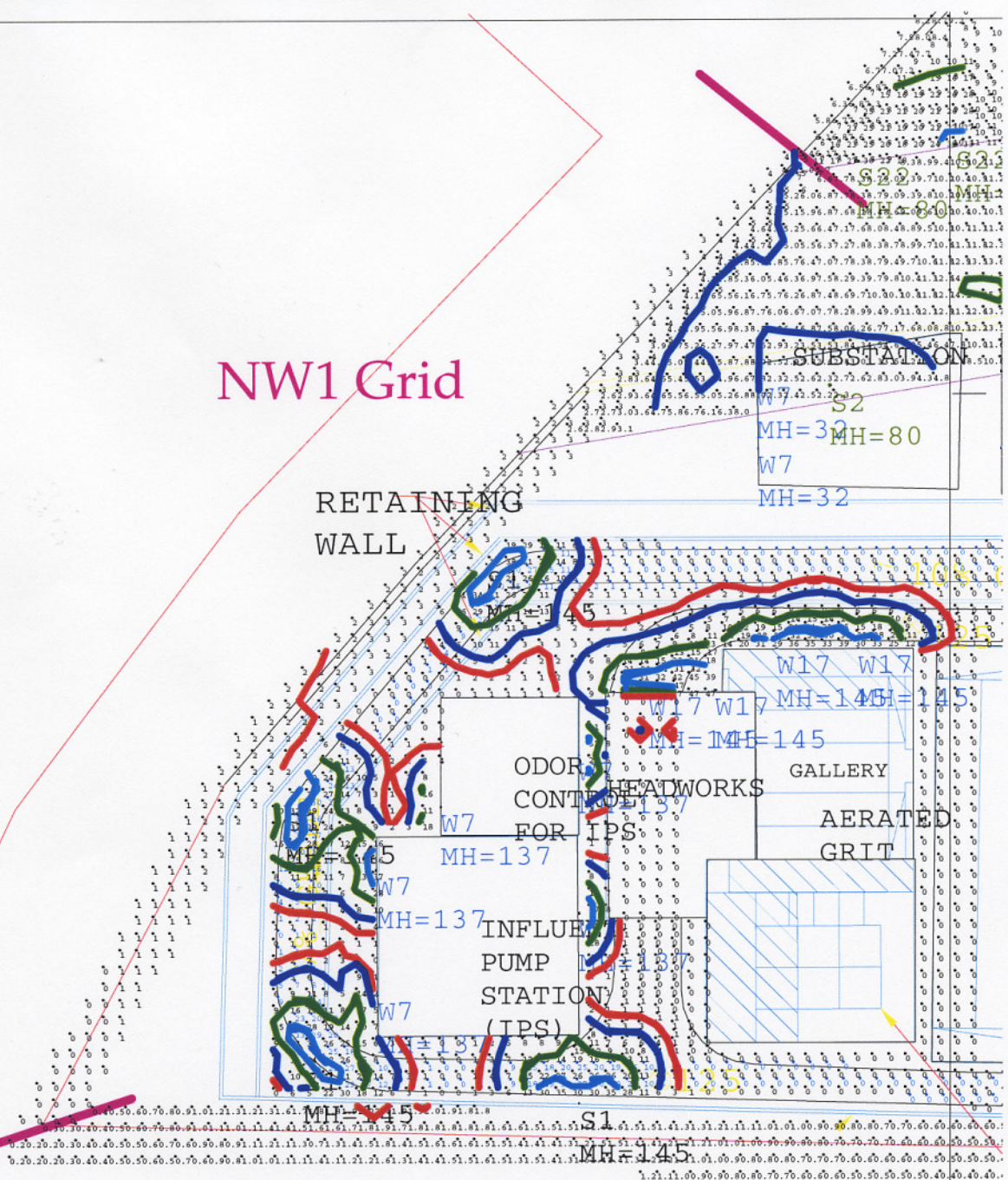


UNOCAL - LID
GRID: H-1

NE2 Grid

SR 104

NW1 Grid



UNOCAL - LID
GRID: E-2

PM1 Grid

P6 Grid

FERRARI Grid

EFFLUENT
PUMP
STATION

CONVENTIONAL
PRIMARY CLARIFIERS

BALLASTED
PRIMARY CLARIFIER

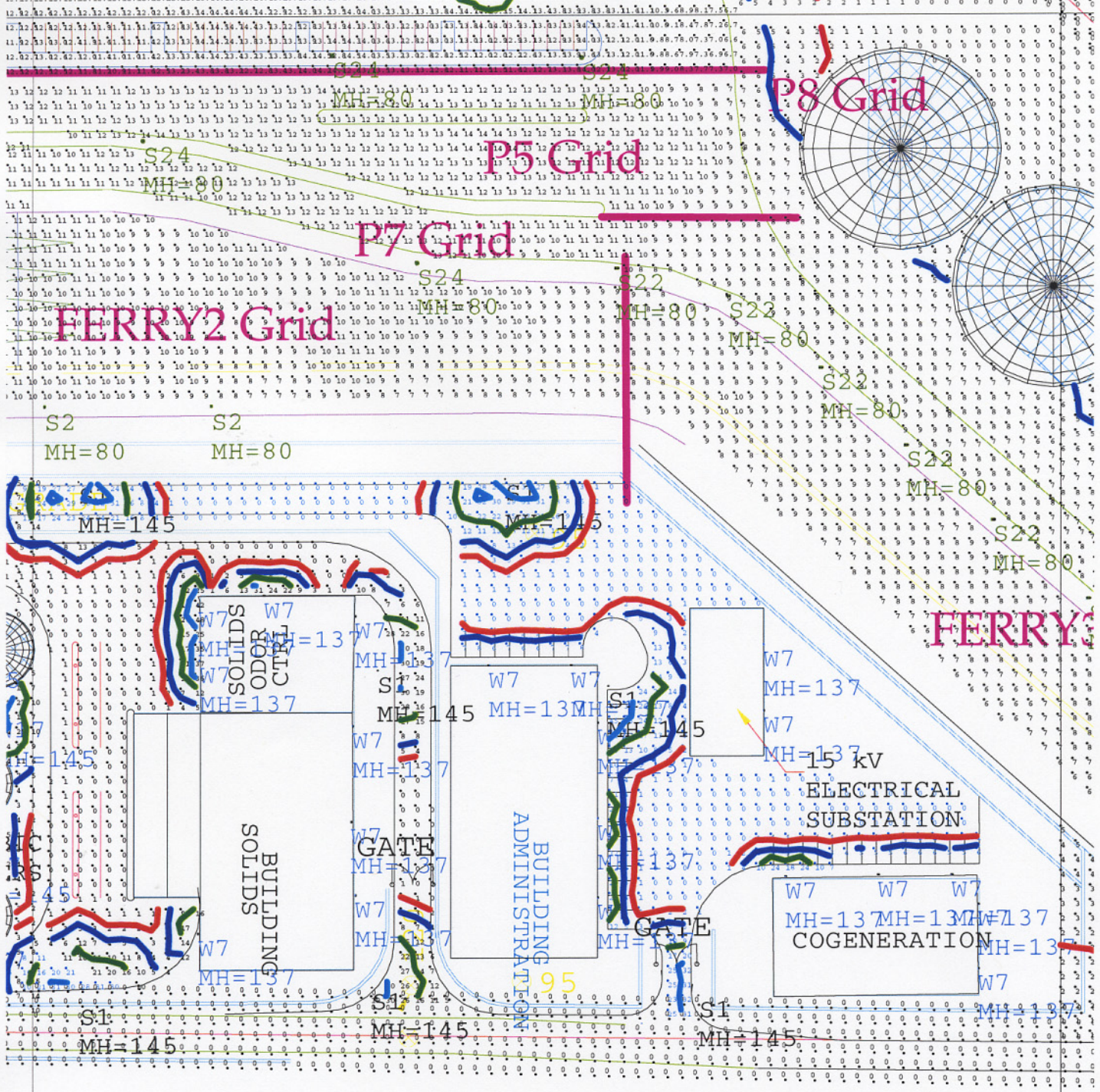
CHEMICAL
BUILDING

ANAEROBIC
DIGESTERS

S1 Grid

PROPOSED
REALIGNED
PINE ST.

UNOCAL - LID
GRID: F-2



S2 Grid

UNOCAL - LID
GRID: G-2



Brightwater Unocal LID option

E

F

G

H

UNOCAL - LID
GRID: E-1

UNOCAL - LID
GRID: F-1

UNOCAL - LID
GRID: G-1

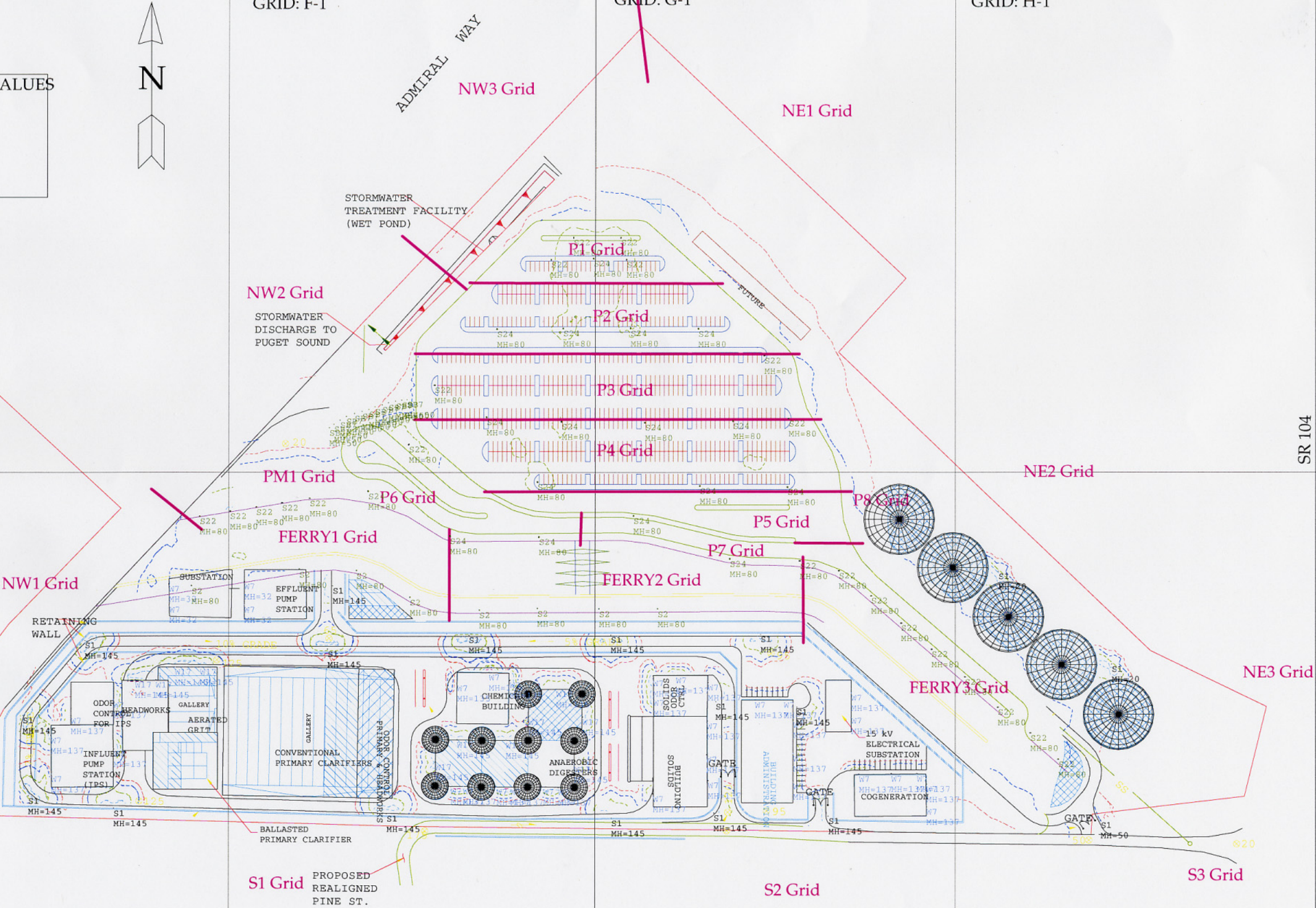
UNOCAL - LID
GRID: H-1

- ISO LINE VALUES
- 2 Lux
 - 5 Lux
 - 15 Lux
 - 30 Lux
 - 50 Lux



1

2



SR 104

UNOCAL - LID
GRID: E-2

UNOCAL - LID
GRID: F-2

UNOCAL - LID
GRID: G-2

UNOCAL - LID
GRID: H-2